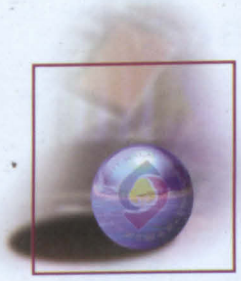
UNIMAS Contributions to Research

the First Five Years



C · O · N · T · E · N · T · S

FOREWORD From the Vice-Chancellor

Academia's interest in doing research has long been in the pursuit of knowledge for knowledge's sake. Academia are eager to publish in journals. They discuss ideas and developments that emerge from their campus laboratories and offices but only within the academic community. From the very onset, UNIMAS recognized this widely advocated role of universities as the pursuers and disseminators of new knowledge. But at the same time, we also realized that events in the past two decades have caused the academic communities to reexamine this traditional attitude. University researchers who once displayed their aloofness towards applied and commercial exploitation of their research data, are today much more open to share their scientific thoughts and accomplishments with industry. They have shown an increased willingness to extend their research interest to address technological issues of importance to the corporate sector and public agencies. Yet in Malaysia many company managers and technical professionals remain unaware or skeptical of this change in attitude amongst the present academic community. Consequently the tripartite alliances between industry, public sectors and universities have not gelled to reap the sought-for benefits.

This research report is intended primarily for corporate executives, technical professionals and researchers engaged in or attempting closer cooperation with UNIMAS. It is also our desire to keep our stakeholders, students and parents, and industry, well-informed on the diversity of research our interest.

Professor Dato' Zawawi Ismail
Vice-Chancellor

From the
Deputy Vice-Chancellor
(Research & Services)

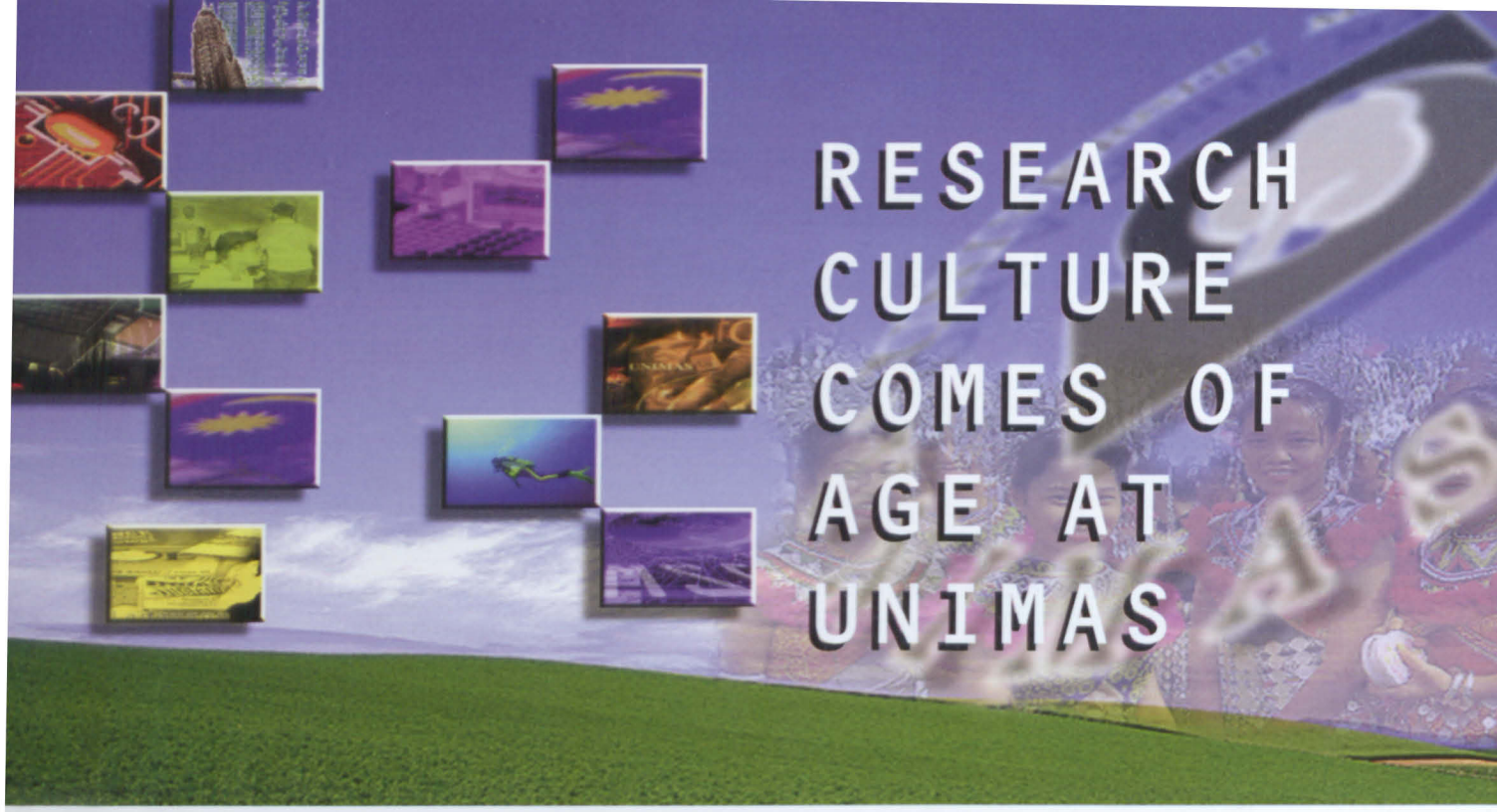
FOREWORD

Five years ago, UNIMAS set out to grow and become a university that will be renowned for it's role in the generation of new knowledge through research. Starting from scratch, it began to promote research in many areas that can lead to developments and change our lives for the better. Drawing from the strengths and opportunities available by virtue of its geographical location in a resource-rich and rapidly developing state of Sarawak, it began by strategically identifying a few niche areas of research. Against all odds, it steadily gain competitive advantage in a range of research areas including medical, environmental, information and communication technologies, engineering, social sciences and creative arts. Nothing was allowed to stand in the way of UNIMAS emerging as a reputable research university nationally and internationally.

Clearly within a short period of our existence we have already created a pool of researchers whose talents and inventiveness are both diverse and abundant. This documentation spells out our research agenda at UNIMAS and contains the voluminous research activities and publications resulting from the tenacious work of our staff to date. Seemingly insignificant discoveries of today can often, with creative lateral thinking and many years of further research and development, become the major innovations of tomorrow. Today we celebrate our primary achievement in developing and nurturing a research culture at UNIMAS and we can now aspire to meet future challenges that only five years ago seemed insurmountable and so overwhelming.

The last five years has been a period of change for everyone at UNIMAS. I would like to thank all members and staff for their support and commitment to realizing our research goals and objectives so far. I am confident that their hard work and dedication will continue to provide the impetus UNIMAS needs to evolve and implement its research strategies into the next millennium.

Professor Ghazally Ismail
Deputy Vice-Chancellor



RESEARCH CULTURE COMES OF AGE AT UNIMAS

Establishing Tradition of Excellence in Niche Area Research

In creating a research culture, UNIMAS has been very pragmatic in its approach. To emerge as a research university UNIMAS growth must be fueled by a massive investment in research activities. As knowledge expands, new resources are needed to fund research in these new areas of knowledge. Already even the great research universities in the US like MIT, Stanford and Harvard, have begun to experience a gap between the expanding knowledge base and the capacity to do high quality research in all of these new areas. The constraints have been both in financial and human resources. Thus there is widespread recognition that universities of today can no longer afford excellence in all areas of knowledge.

As a new university, UNIMAS will not be able to live with the illusion that it can grow and remain viable without taking cognizance of this universal constraint. It must make the many difficult choices about which new areas of knowledge to delve and achieve true distinction. Through creative and strategic decisions, UNIMAS has identified those areas in which it has comparative advantages in developing and maintaining true distinction. It concentrates on building its research strength through promotion of real cross-disciplinary work and in areas that are unique to the region.

Strong support has been given to research areas that promote interdisciplinary and cross-faculty interactions and partnership. This has resulted in the creation of a pool of high-quality researchers looking at specific issues or problems through a variety of perspectives. Central to this is the building of partnerships and the establishment of a critical mass that is much needed in optimizing a small pool of expertise currently available during these formative years of UNIMAS.

To achieve preeminence in research and become a world-class university requires that we be fully engaged in high quality research. Our researchers too must have the ability to interact fully and openly with other researchers, both nationally and internationally. The high quality and international character of our research has been reflected in the recognition and high profile accorded by the international scientific community to some of our activities; especially in areas related to the molecular medicine of dengue and coral reef research.

Ensuring *Economic & Social* Relevance in Research

In setting the research agenda, UNIMAS has moved forward by also addressing the fundamental questions on research significance and relevancy. The choice of research areas has focused on issues that play a central role in the achievement of national economic and social goals. For example, in its effort to fully capitalise on the social and cultural richness of its location the Faculty of Social Sciences has made Minority and Marginal Groups study as one of the niche areas of research. Our researchers from this Faculty have embarked on a project to determine the consequences of development and modernisation on the various ethnic groups of Sarawak and other social groups such as women, the handicapped and the poor. A project funded through IRPA grant looks at the impact of tourism on the longhouse communities in Sarawak. It takes into account a range of cultural, environmental and economic issues that often cloud efforts to aggressively promote the tourism industry in Sarawak. While tourism is an increasingly important foreign exchange earner for the country it is also a harbinger of many social ills. This research aims to understand the dynamics of tourism industry at the local level and its interplay with the local social system. Among the gender issues that researchers in this Faculty have been actively investigating include Labour Allocation and Decision Making in Agricultural Production among the Kelabits of Bario; Mental Health and Social Integration in Sarawak, and The Participation of Women in Sarawak Politics.

The Faculty of Resource Science and Technology (FRST) has adopted a strategic orientation in it's quest to contribute to economic agenda of Sarawak. The sago plant *Metroxylon sp.* has been dubbed as the "crop of the future" in view of its great potential in meeting the need for starch and other carbohydrate-based industries. Preliminary attempts to identify specific genes of sago plants have started and the determination of chemical properties of sago starch has also been pursued vigorously through the collaborative work of our researchers and Salford University, UK.

The Faculty of Economics and Business has also directed their research output at meeting the needs of Sarawak and the surrounding region. For instance, the Sarawak Technical Manpower Study was initiated to help the State in its effort to design and firm up manpower policies that can bring optimal economic benefit and are sufficiently robust to face its ever-challenging economic future.

The Faculty of Applied and Creative Arts (FACA) completed a comprehensive study on the need and feasibility of establishing a Centre for Arts and Culture in Kuching. The result of the study will be submitted to the State Government to enable policy decision be made on the establishment of such a Centre to encourage and promote diverse cultural activities in the region.

The Institute of East Asian Studies (IEAS) has as its research priority transnational studies of capital labour and information flows as well as regional environmental issues, all in the context of globalization.

Probing the Emerging & Neglected Health Issues of Local Importance

In medical research, great emphasis has been placed on elucidating the mechanisms and control of diseases that are of local importance and often sorely neglected by scientists of the developed nations. Thus diseases like nasopharyngeal carcinoma, Japanese encephalitis, dengue and melioidosis have received much of our attention at The Institute of Health and Community Medicine (IHCM). In collaboration with a biotechnology company, Venture Technologies Sdn Bhd, IHMC succeeded in bringing to market a second generation kit for dengue diagnosis. This new kit was based upon the detection of dengue virus specific IgM in a nitrocellulose format, and is the first IgM test of its kind for any infectious disease. The achievement marked the first milestone in the IHMC's mission to design and develop appropriate technologies towards improving healthcare in the country, and indeed in the world.

In the middle of 1997, the IHCM played a leading role in the laboratory investigation of the etiology of a disease outbreak that caused the sudden deaths of more than 20 infants in Sarawak. The Institute has successfully isolated a previously undescribed adenovirus in specimens obtained from fatal cases during the outbreak. The same year also saw the filing of a patent by IHCM on the design of a recombinant vaccine against dengue haemorrhagic fever in collaboration with industrial and other academic partners.

At the Faculty of Medicine and Health Sciences (FMHS), the focus of research activities has been both the tropical diseases and community medicine. Much interest has been placed on unraveling the population biology of mosquito vectors and disease transmission dynamics of malaria and dengue. For example, new *Aedes* indices on dengue vector surveillance have been developed and are being field-tested for their sensitivity and reliability. Through a collaborative research with the University of Leeds, an understanding on the genetic diversity of *Anopheles* vectors has been advanced through the isolation of microsatellite DNA from natural populations of *An. leucosphyrus* and *An. balabacensis* collected in many parts of both Sabah and Sarawak. Rapid development, industrialization and urbanization all have resulted in significant changes in the lifestyles of the Malaysian people including those in Sarawak. This has in turn brought about changes in the disease patterns afflicting different communities. Our staff at the FMHS have been engaged in many aspects of community health research including family health, environmentally-related diseases and socio-behavioural aspects of illnesses.

Responding to Agenda 21 of the UNCED

Our Institute of Biodiversity and Environmental Conservation (IBEC) continues to maintain as an active institutional platform dealing with biodiversity research. To date it has succeeded in building an extensive knowledge base of both terrestrial and marine biodiversity for Sabah and Sarawak. The Institute has seen a meteoric rise in activity in the field of marine science, with research programmes ranging from marine turtle research and species conservation to coral reef surveys at various locations in Sabah and Sarawak. The year 1997 was designated by the United Nations as the International Year of the Reef. In our effort to actively participate and contribute to this UN initiative, IBEC took part in the first ever global survey of the world's coral reef, called Reef Check 97. Our Institute now has been assigned the task of monitoring over 17% of all the coral reef sites in the world. During 1997 alone, the UNIMAS research team surveyed over 2500km of the coastline of Sabah using the research protocol stipulated by Reef Check 1997. Data was collected for corals and benthic life forms, macro-invertebrates and fish. The information collected is today being used in the preparation of coastal management plan for Sabah and Sarawak.

The coral reef project on Layang-Layang atoll, 300 km north of Kota Kinabalu, has been successfully completed and documented to provide evidence of its critical role as a net primary producer for the South China Sea fisheries. Permanent quadrant surveys for corals and associated marine communities have now been established off the coasts of Layang-Layang and Sandakan for long-term monitoring of coral health and growth rates.

On terrestrial biodiversity, IBEC continues to develop an impressive database of the marvellous diversity of Bornean flora and fauna. The development of the database on Sarawak orchids was completed and ready for publication. This invaluable work will enable botanists from around the world to access undated information on native orchid distribution and collections. The collection of ethnobotanical specimens under the Kinabalu Ethnobotany Project (KEP) continues along with social studies in villages surrounding the Mount Kinabalu Park Sabah. A major undertaking in this KEP has been the identification and labeling of plant specimens, which currently number in excess of 8000. A comprehensive database of the birds of Sarawak has also been compiled and will be made available electronically on the Internet.

Among the several millions of species that live in our vast rainforests, there may be life-saving or commercially valuable substances that await discovery by science. There have been great interest and enthusiasm about collecting, documenting and preserving these species before they become extinct in nature. This biodiversity prospecting is envisaged as a venture capable of yielding new medicines and superior crops needed to provide for and sustain the growing world population. UNIMAS researchers have been actively engaged in collecting, inventorying and screening of plants from our forests. Several major conservation areas and ecologically threatened habitats were explored including the Kinabalu Park Sabah, Simunsam Wildlife Reserve, Bako National Park, Batang Ai and Batang Balui basins.

Enabling Technologies: The Search for a Common Ground

Today we are witnesses to the emergence of a new generation of enabling technologies that is often hailed as a panacea for a host of problems faced by humankind now and in the near future. At UNIMAS deliberate efforts have been made to seek and embrace new technologies that can potentially create new avenues for research. For example, the unprecedented speed of technological change in data analysis through image processing has prompted UNIMAS to establish a Spatial Analysis Laboratory in the newly established Institute of Software Technology. The laboratory now is useful to researchers in a variety of disciplines from different faculties. It enables researchers in the fields of biodiversity, resource tenure, environmental science, medical diagnosis and epidemiology to utilize this increasingly important state-of-the-art technology for data analysis and information management.

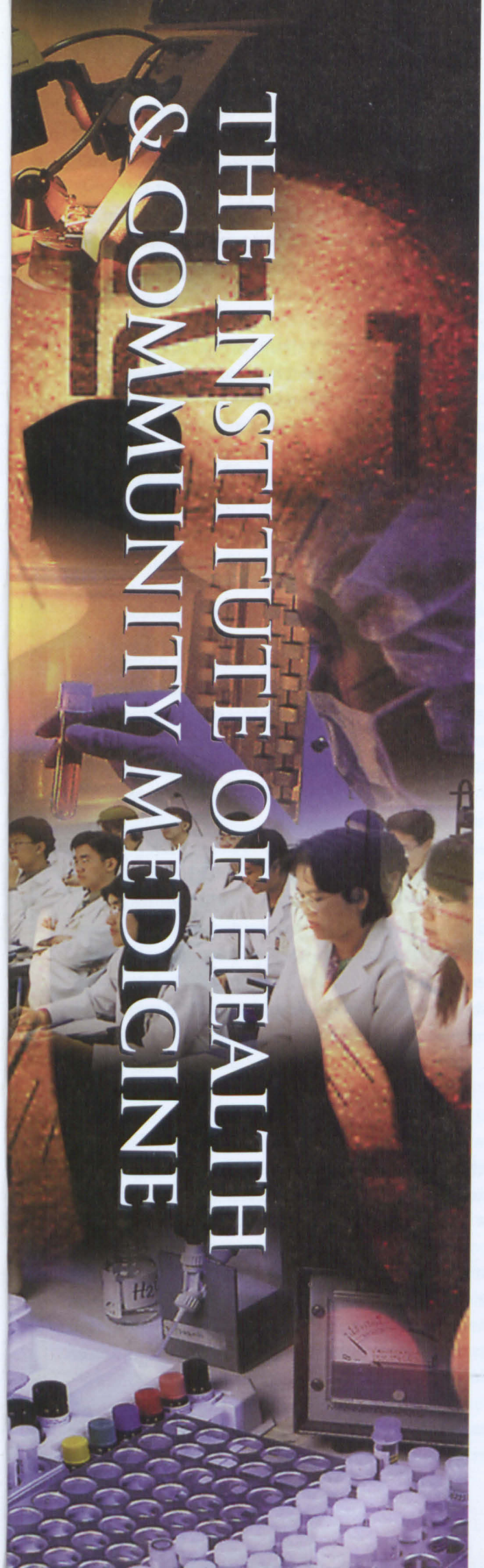
In the area of communication technology, our Faculty of Engineering has become the champion in the promotion and application of wireless technology. The Engineering Computer and Information Network (ECIN) using wireless technology has started operation at UNIMAS since 1995 and is now fully used in the Faculty's teaching-learning activities and research. This wireless computer network is the first in Malaysia and has since become a showcase of the latest transmission technology for many interested agencies outside UNIMAS.

The Virtual Campus project of the Faculty of Information Technology (FIT) is yet another example that mirrored our attempt to harness enabling technology that will be of common use to everyone. This project aims to develop intelligent and multimedia support for distance learning. It involves the integration and development of various state-of-the-art technologies that will create a single platform for distance course delivery. The ultimate research product is envisaged to become a significant milestone in the future provision of education through virtual learning that subscribes to the concept of providing teaching-learning opportunities to anyone, anytime and anywhere.

For a resource-rich state like Sarawak, biotechnology is expected to play an especially important role in greatly influencing the economic basis for many exploitative means and management of its diverse natural resources. DNA-technology has now become central to much of the research activities carried out at UNIMAS. These powerful molecular techniques have become invaluable in the areas of both floral and faunal taxonomic research especially in resolving their conservation values and status. Researchers at our Faculty of Resource Science and Technology (FRST) have started utilizing the immense power of these novel techniques to study Bornean frogs, fruit bats and birds in their attempt to understand the taxonomic, evolutionary and ecological aspects of these endangered species.

Bridging the Gap Between *Industry and University*

UNIMAS recognizes its role in developing the productive interface between the academic and the practical. It remains constantly alert to new opportunities to serve the non-academic community. Where there is a clear commonality of interest and a complementing of skills and capacities, UNIMAS seeks to establish strong ties with the private sector and appropriate government agencies. The Centre for Technology Transfer and Consultancy (CTTC) was set up in October 1993 to serve this role. In the past five years, the CTTC has played an important role in bridging relations and the transfer of technology and expertise between the university, industries and the community. Since its inception, it has successfully facilitated the accession and completion of a total of 75 projects which included consultancy services, contract research, contract education and management of conferences. The contract value accumulated during the last five years was RM 14.8 million. The services rendered have benefited more than fifty clients that comprised of small, medium and major companies, government agencies and corporations. Not less than 150 academic and supporting staff have been directly or indirectly involved in the provision of these services through CTTC.



THE INSTITUTE OF HEALTH & COMMUNITY MEDICINE

INTRODUCTION

The Institute of Health and Community Medicine (IHCM) began operations in June 1995 with the appointment of the founding director. Our location provides us with the unique opportunity to study tropical diseases and other diseases of importance to the region in the locations where the diseases are occuring. Our excellent and state-of-the-art facilities enable us to do sophisticated research without resorting to collecting specimens for study elsewhere and thus we are able also to respond rapidly to emerging diseases arising in the community when necessary.

This was exemplified by our investigation of the deaths of young children suffering from acute myocarditis in Sibu in mid-1997. We were able to isolate and characterise a new strain of adenovirus by cloning and sequencing fragments of the virus genome. The information derived from the sequencing is being used to design new molecular based tests for rapid diagnosis and community surveillance for early warning of impending outbreaks.

In the two and a half years of our existence we have set up laboratories with the capacity to provide opportunities to conduct research using modern cell and tissue culture, virology, molecular biology, genetic engineering, immunochemistry, biochemistry and analytical chemistry. We have a small but dynamic academic staff comprising a virologist, a biochemist and a chemist, with 8 postgraduate students, one medical laboratory technician and 5 laboratory support staff training to be laboratory technicians.

The IHCM is dedicated to several integrated research programmes which will address fundamental problems in the disease process, and at the same time generate new knowledge for application to practical problems of improved diagnosis, vaccine or drug design and disease control. In so doing, we expect to bring the benefits of modern molecular medicine applied to diseases of local and regional interest to health care providers and the community. We already have kits for the diagnosis of dengue fever and Japanese encephalitis on the market, and UNIMAS has recently filed two patents on the design of a vaccine against dengue haemorrhagic fever.

We are commited to the principle of accountability to the community. All our projects are governed by strict ethical standards, informed consent, conservation of the environment and respect for cultural practice. Besides conducting the science in our research we also expect to develop innovative programmes by which the community as a whole will benefit from our research findings, especially in our drug discovery and molecular medicine programmes where new therapeutic agents or treatment modalities may have commercial potential.

The IHCM also works closely with the Ministry of Health in Sarawak, particularly in supporting their efforts to control dengue and Japanese encephalitis. Sarawak has the highest incidence of Japanese encephalitis in Malaysia and to assist in the control of this devastating disease of children, we began to provide support services for the identification of Japanese encephalitis-active areas for vector control efforts in 1997.

Working in close collaboration with the IHCM is a local biotechnology company, Venture Technologies Sdn Bhd (VT), which commercialises the dengue and the Japanese encephalitis diagnostic kits. Development research programmes in collaboration with VT and a Danish biotechnology company, Bavarian Nordic, are focused on the development of a recombinant (genetically engineered) vaccine against dengue haemorrhagic fever.

RESEARCH PROGRAMMES

Vector borne diseases

Dengue fever and dengue haemorrhagic fever, Japanese encephalitis and malaria are all infectious diseases which are transmitted by mosquitoes, and are important in Borneo, the rest of Southeast Asia, India, parts of China, the Pacific, Africa and South America. The IHCM programme on vector borne diseases is centred around the mosquito borne viruses causing dengue and Japanese encephalitis. Multiple aspects of these diseases are being studied to address problems ranging from a fundamental understanding of pathogenesis, to the molecular epidemiology of the viruses in Borneo, and to control of these diseases by studying vaccine design strategies.

One project investigates the host factors involved in risk of severe disease in dengue infection, while others study in detail the molecular topology of the major virus encoded proteins and the host immune response to these. The results so far have helped us identify sequences which can be used as minigenes for making genetically engineered vaccines against dengue infection.

For Japanese encephalitis, we are especially concerned with the development of rapid diagnostic tests to confirm the infection at the bedside of ill childen. We also are developing a vaccine which will limit the spread of the virus in its natural mammalian reservoir which are domestic pigs, and in this way protect the human population from the spillover infection which characterizes this zoonotic disease.

Malaria remains the pre-eminent tropical disease with an estimated 170 million cases occuring per year, of which over a million result in death. The disease has been resurgent in the last two decades despite massive efforts to control and eradicate the disease in recent years. Today, the problems of control and treatment of malaria are more difficult than ever in the light of the evolution of drug-resistent strains of malaria.

The goals of the IHCM are severalfold. We hope to develop new compounds as new anti-malarial drugs and to use them as probes to discover molecular targets in the parasite responsible for the disease. These studies in turn will be useful in developing new treatment modalities and possibly a vaccine for the prevention of malaria.

New and emerging diseases

The cultural, ethnic and biodiversity of Sarawak offers unique possibilities in studies of comparative epidemiology and the interaction of various environmental and host factors in the disease process. The very nature of this research programme demands that we maintain a flexible approach to our subject matter and are technically as well as intellectually able to respond rapidly and appropriately to new or emerging diseases and to be able to recognise these as such.

Our initiation by fire occurred in mid 1997 when we were on hand to assist the Sarawak health

authorities in the investigation of the deaths of 31 children in Sarawak in the midst of a massive outbreak of hand-foot-and-mouth disease. It was inevitable that physicians and scientists would confuse the etiologies of the two diseases and assume that whatever caused hand-foot-and-mouth disease would also be the cause of mortality in the children. However, a clearer understanding of the nature of the disease spectrum expected in an enterovirus outbreak should have alerted authorities to the fact that the clinical syndrome recognised by the local paediatricians was by any account unusual and that an investigation avoiding tautological arguments would have to be carefully conducted.

It was unfortunate that these pitfalls were not apparent to most of the parties involved in the investigation, and the IHCM was forced to work very much in isolation at a point when our facilities were only just beginning to come into active use.

We nevertheless were able to confirm that the hand-foot-and-mouth disease outbreak was caused by an enterovirus as expected, but we found that most of the fatal cases did not have an active enterovirus infection and that in fact a different virus was associated with some of these cases. Our expertise in classical virology as well as molecular biology enabled us to grow and purify the genome of a new strain of virus which we have characterised by sequencing and other techniques. We have also purified a structural protein from this virus and we have, in collaboration with the Division of Molecular Pathology at the Institute for Medical Research in Kuala Lumpur, prepared an antiserum which identifies the virus.

Currently our priorities in the study of this particular disease are the development of rapid diagnostic assays based on the polymerase chain reaction. We hope also to study the pathogenesis of the disease and to understand how the heart was affected.

Aside from the new or emerging diseases which nature might bring to our attention by dramatic means, we are also concerned with anticipating the rise of diseases which are known but not thought to be currently important. One such disease is meliodosis, a bacterial infection which can cause severe pneumonia and/or septicaemia with a very high case fatality rate. The bacteria causing meliodosis, Burkholderia pseudomallei, is found in areas which are wet and muddy such as wet padi fields, and - more important in Sarawak - muddy river banks, and is often underdiagnosed.

In a preliminary survey of communities along the Rejang done in 1994, we found that there was serological evidence of exposure to Burkholderia pseudomallei . In order to be ready to respond to the possibility that the commercial activities occuring in the region will increase the exposure of both the resident population as well as the incoming labour (construction workers, logging workers), we have two projects on meliodosis. One of these is a study of the seroprevalence as well as the molecular epidemiology of Burkholderia pseudomallei environmental and clinical isolates in Sarawak and elsewhere in Malaysia. The second project aims to develop a rapid diagnostic test for active meliodosis based on Burkholderia pseudomallei -unique antigens we have identified in a clinical isolate from Sarawak. Such a test would improve the diagnostic capability of rural hospitals where it is likely that most meliodosis cases will first be seen.

Molecular medicine

Molecular biology offers very powerful tools for the study of disease and disease susceptibility. In the molecular medicine programme we have identified nasopharyngeal carcinoma (NPC) as a priority research area. This is a multifactorial disease found particularly among Chinese originating from southern China, with other risk factors considered to be associated with certain elements of diet and also with Epstein Barr Virus (EBV). It has been noted that in Sarawak some ethnic groups also have a high prevalence of NPC and often the disease develops earlier and may deteriorate more rapidly. The unique gene pool of the Sarawak native population who appear to be more susceptible to NPC may provide some insights into the genetic background predisposing to NPC and we have a research project which studies familial NPC and hopes to discover genes which may be associated with development of NPC. Once potential molecular targets are identified, the results will be used in our drug discovery programme to discover novel drugs for NPC.

Another project in this programme is the study of Southeast Asian ovalocytosis (SAO) which we have found in some communities. This is a disorder of the red blood cell membrane which does not have any overt disease manifestations but which has, like sickle cell anaemia in Africa, been associated with resistence to malaria. We are currently trying to determine the nature of the mutations involved in the communities in Sarawak and expect to investigate the prevalence of SAO on the molecular level in relation to the incidence of malaria in these communities.

Drug discovery

The tropical rainforests of Borneo are mong the most diverse in the world in terms of both plant and animal species, and the potential for developing new drugs from natural compounds extracted from plants is great. Initially we are targetting plants used in traditional treatments for various diseases by the different indigenous groups in Sarawak. Documentation of the plants and remedies used will be followed by a rigourous scientific search for active compounds and confirmation of their activity in biological assays. Malaria is one such disease that we are currently investigating, and we hope to extend our work to include Herpes Zoster and nasopharyngeal carcinoma.

In the future we shall be studying other naturally produced compounds derived from various aquatic species and frogs found in the local costal environment and tropical rainforest, respectively. The compounds from these species have potential for development as new therapeutic agents in disease research.

RESEARCH COMMUNICATIONS

A. PUBLICATIONS

Cardosa, M.J., Sharifah Hamid, Samuel-Verghese, S., & Yeang, H.Y.
Monoclonal antibodies identify different antigens in proteins eluted from natural rubber latex gloves obtained from different sources.
J. Nat. Rubb. Res., 9(4), 270-277. 1995.

An indirect enzyme linked immunosorbent assay (ELISA) was used to show that proteins eluted from different samples of natural rubber latex gloves contained different relative proportions of various antigens as defined by monoclonal antibodies directed against B-serum and C-serum proteins. Thus some gloves with low total protein content were shown to have a high proportion of one of these antigens, but negligible amounts of other antigens, while some other gloves had high level of more than one antigen tested. These differences become important if some of these antigens are more allergenic than others, and this report highlights the inadequacy of total protein quantitation in the absence of specific immunoassays as a measure of the safety of a product.

Sunderasan, E., Samsidar Hamzah, Sharifah Hamid, Ward, M.A., Yeang, H.Y. & Cardosa, M.J.
Latex B-serum ß-1,3-glucanase (Hev b II) and a component of the microhelix *(Hev b IV)* are major latex allergens.
J. Nat. Rubb. Res. 10(2), 82-99. 1995

Two allergenic (IgE-binding) proteins have been isolated from the B-serum of natural rubber latex by dialysis-induced protein precipitation followed by gel filtration. One of the allergens, Hev b II, that is specific to the monoclonal antibody USM/RB4, commonly appears as a doublet of molecular weights 34 and 36 kDa under reducing conditions of SDS-polyacrylamide gel electrophoresis. In the absence of 2-mercaptoethanol, a 70 kDa band can also be seen in addition to the doublet. The allergen has a pI of circa 9.5 and is identified as ß-1, 3-glucanase. The second allergen, Hev b IV, has a pI at circa 4.5 and appears under reducing conditions as a band of 50-57 kDa. In its unreduced form, a principal band of approximately 100 kDa is discernible. Immuno-gold labelling with the monoclonal antibody USM/RB3 shows that Hev b IV is a component of the microhelix protein complex of B-serum.

Cardosa, M.J., Fazeha Baharudin, Sharifah Hamid, Tio, P.H. & Nimmannitya, S.
A nitrocellulose membrane based IgM capture enzyme immunoassay for etiological diagnosis of dengue virus infections.
Clinical & Diagnostic Virol. 3, 343-350. 1995.

A nitrocellulose membrane based immunoassay for the detection of dengue virus specific IgM suitable for use in field situations or in peripheral laboratories would be useful for disease surveillance

and control. This paper describes such an assay in an IgM capture format (MAC DOT) similar to the microplate based MAC ELISAs currently in use in several research and reference laboratories around the world. The MAC DOT was tested on several sample sets including a retrospective study of 119 patients from Children's Hospital, Bangkok, Thailand, with confirmed dengue infection. The sensitivity of the test was shown to be 94% taking only admission sera into consideration but rising to 99% when both an admission and a discharge specimen were considered. Other sample sets confirmed the high sensitivity and a study of 494 unselected febrile children showed that the specificity of the MAC DOT was 98%.

Cardosa, M.J., Tio, P.H. & Kaur, P.
Japanese encephalitis virus is an important cause of encephalitis among children in Penang,
Southeast Asian Journal of Tropical Medicine & Public Health, 26, 272-275 1995.

This study was carried out to determine if Japanese encephalitis virus is an important causative agent of viral encephalitis among pediatric admissions in Penang, Malaysia. 195 children with CNS symptoms and 482 children with non-specific febrile illness admitted into the Pediatric ward of Penang Hospital during a 16 month period were entered into the study. The presence in serum of cerebrospinal fluid (csf) of Japanese encephalitis virus (JEV) specific IgM was determined by an IgM capture ELISA and cytomegalovirus (CMV) specific IgM was determined using a commercially available kit (Behringwerke AG). It was determined that 5 of 13 children with a discharge diagnosis of viral encephalitis had JEV specific IgM in csf, indicating that 38.5% of the viral encephalitis cases was due to JEV. One of the non-JEV cases was found to have mumps virus specific IgM in csf, while no etiology was determined for the other cases. It was also determined that 4 of the 195 (2.1%) cases with CNS symptoms had IgM to CMV, suggesting CMV may be an agent of encephalopathy in children in Penang. Other viruses found to be associated with CNS symptoms in children admitted into our study were measles and herpes simplex virus. A viral etiology was confirmed for 13 of the 195 cases (6.7%).We also screened 482 non-specific febrile cases for IgM to JEV and to dengue viruses and found that 2 (0.4%) had IgM specific for JEV and 9 (1.9%) had IgM specific for dengue virus.

Halimah Mohamed, Balasubramaniam, V., Cardosa, J., Sinniah, M., Igarashi, A. & Tanaka, H.
Comparative assay on dengue IgM-ELISA using reagents form 2 sources.
Trop. Med., 37(3), 109-114. 1995.

In order to distribute dengue IgM-capture ELISA to the peripheral laboratories, supply of key reagents should be established by local production. In this study, comparative IgM-capture ELISA was carried out on a total of 237 sera using key reagents from 2 sources. The current set consisted of suckling mouse brain (SMB)-derived dengue type 2 (D2) antigen and a D2 monoclonal antibody (MAb) supplied from the United States. While an alternative set was supplied by one of the authors, consisting of tissue culture-derived dengue antigen (TCA) and MAb established in USM. When the IgM-ELISA results were compared with those by the hemagglutination -inhibition (HI) test as a gold standard, the sensitivity was 50.0% by the current set and 75.0% by the alternative set of reagents, respectively. While the specificity was 95.2% by the current set and 90.3% by the alternative set of reagents. The results showed that the alternative set of reagents can effectively be used in dengue IgM-ELISA and is significantly more sensitive than the current set of reagents (Chi SQR =12.26, $P<0.01$) at less than 1% risk. However there is no significant difference in specificity between the two reagents (Chi SQR= 2.45, $0.5>P>0.1$) at 10% risk.

Yeang, H.Y., Cheong, K.F., Sunderasan, E., Samsidar Hamzah, Chew, N.P., Sharifah Hamid, Hamilton, R.G. & Cardosa, M.J.
The 14.6 kD Rubber elongation factor (Hev b 1) and 24 kD (Hev b 3) rubber particle proteins are recognised by IgE from patients with spina bifida and latex allergy.
J. Allergy Clin. Immunol. 98(3), 628-639. 1996

Two major water-insoluble proteins are located on the surface of rubber particles in Hevea brasiliensis latex. A 14.6 kd protein (Hev b 1), found mainly on large rubber particles (>350 nm in diameter), and a 24 kd protein (Hev b 3), found mainly on small rubber particles (average diameter, 70 nm), are recognised by IgE from patients with spina bifida and latex allergy. Although Hev b 1 (also called the rubber elongation factor (REF( ) has previously been reported as a major latex allergen, this conclusion has been disputed on the

basis of results from other studies. The allergenicity of Hev b 1 is verified in this study by testing the recombinant protein generated from its gene. Because allergenicity is confined to patients with spina bifida and not observed in adults sensitive to latex, it is not a major latex allergen. The identification of Heve b 3 as another allergen originating from rubber particles is confirmed by immunogold labeling and electron microscopy. Observations with the monoclonal antibody USM/RC2 developed against Hev b 3 show that the protein has a tendency to fragment into several polypeptides of lower molecular weight (from 24 kd to about 5 kd) when stored at -20(C. There is also indication of protein aggregation from the appearance of proteins with molecular weights greater than 24 kd. Fragmentation of Hev b 3 is induced immediately on he addition of latex B-serum, which is normally compartmentalized in the lutoids in fresh latex. In the preparation of ammoniated latex (used for the manufacture of latex products), the lutoids are ruptured, and the released B-serum reacts with Hev b 3 on the rubber particles to give rise to an array of low molecular weight polypeptides that are allergenic to patients with spina bifida. (J Allergy Clin Immunol 1996;98:628-39).

Sittisombut, N., Sistayanarain, A., Cardosa, M.J., Salminen, M., Damrongdachakul, S., Kalayanarooj, S., Rojanasuphot, S., Supawadee, J. & Maneekarn, N.
Possible occurrence of a genetic bottleneck occurred in dengue serotype 2 viruses between the 1980 and 1987 epidemic seasons in Thailand.
Am. J. Trop. Med. Hyg. 57(1), 100-108. 1997.

Cocirculation of two genetic subtypes of dengue serotype 2 viruses was first observed in the 1980 epidemic season in Thailand. To further delineate the evolutionary history and the contribution of these subtypes to subsequent epidemics, we determined the envelope glycoprotein gene sequence of 20 dengue serotype 2 viruses isolated from infected patients during 1987 and compared them with those derived from earlier years. Subtype IIIa strains represented the majority (18 of 19) of dengue type 2 viruses derived from Bangkok metropolitan area, whereas all three strains from a province in the northeastern region belonged to subtype IIIb, indicating uneven local distribution of dengue subtypes within the same year. Three types of sequence variation were identified in both subtypes: substitutions that were unique to individual strains; subsitutions that were shared among all subtype IIIa or IIIb viruses of both the 1980 and 1987 epidemics; and those that were shared only among all subtypes IIIa or IIIb viruses of the 1987 epidemic, but were absent from the corresponding subtypes of 1980. While the first and second types of substitution were indicative of the most recent random mutations and previous mutations that had been fixed in virus populations, respectively, the third type suggested possible occurrence of a genetic bottleneck and subsequent expansion of one or a limited number of subtype IIIa strains in Bangkok between 1980 and 1987. Immunoblot analysis of intracellular NS1 antigen with anti-NS1 monoclonal antibodies also revealed antigenic heterogeneity of the NS1 protein that correlated with the subdivision based on envelope protein variation.

Suchitra Nimmannitya & M.J. Cardosa.
Dengue Haemorrhagic Fever.
In *Oxford Textbook of Medicine, D.J. Weatherall, J.G.G. Ledingham & D.A. Warrell, eds., Oxford University Press, Oxford, Uk., pp 419-423. 1996.*

MJ Cardosa
Dengue Vaccine Design: Issues and Challenges.
British Medical Bulletin

Dengue virus infection is now a global problem affecting tens of million of people. The spread of the four dengue virus serotypes had led to increased incidence of dengue haemorrhagic fever (DHF) reported and with 2.5 billion people at risk, efforts towards the development of safe and effective vaccines against dengue must be accelerated. This chapter reviews some of the important lessons of pathogenesis which may be learnt from classical studies in the field and place these in the context of current knowledge about the molecular biology of the virus. The issues which have to be addressed in designing a safe vaccine against dengue are raised and the problems of designing subunit as well as whole virus vaccines are pointed out, particularly with regard to the phenomenon of antibody dependent enhancement and more generally the problem of immune potentiation of disease. More efforts must be made to understand the basis of pathogenesis in DHF and in finding out what nature has to teach about protection against and recovery from dengue virus infection.

B. CONFERENCE AND SEMINAR PRESENTATIONS

Cardosa, M. J.
Development of a kit for the diagnosis of dengue virus infections: MAC DOT
The 7th National Biotechnology Seminar. Langkawi, December 1995

This poster describes a nitrocellulose membrane based immunoassay for the detection of dengue virus specific IgM suitable for use in field situations or in peripheral laboratories in an IgM capture format (MAC DOT). The assay was tested on several sample sets including a retrospective study of 119 patients form Childrens' Hospital, Bangkok, Thailand, with confirmed dengue infection. The sensitivity of the test was shown to be 94% taking only admission sera into consideration but rising to 99% when both an admission and a discharge specimen were considered. Other sample sets confirmed the high sensitivity and a study of 494 unselected febrile children showed that the specificity of the MAC DOT was 98%.

Cardosa, M.J.
Issues in the design of second generation diagnostics and vaccines for control of dengue haemorrhagic fever
26th Congress of the International Society of Haematology, Singapore, August 1996

Dengue virus belongs to the family Flaviviridae which are arthropod borne viruses with a genome consisting of a positive single stranded RNA about 11 kilobases long, encoding a single polypeptide chain which is cleaved to form the 3 major structural proteins C, M and E, as well as 7 non structural proteins. The virus is the causative agent for dengue fever (DF) as well as the more severe dengue haemorrhagic fever (DHF) and dengue shock syndrome (DSS) which are becoming increasingly important as a cause of morbidity in Southeast Asia, South America, the Caribbean, the Pacific, China and Taiwan. This paper discusses the need for a concerted effort to design novel approaches to control of the virus, focusing on the design of diagnostic tools and vaccines. A successful live attenuated vaccine against the prototype flavivivirus yellow fever virus (YFV) has long been in use, as have been the more recent vaccines against Japanese encephalitis virus (JEV) and tick -borne encephalitis virus (TBEV). There is also a live attenuated dengue vaccine in trial at this time. It is important, however, to consider the design of recombinant subunit vaccines for the control of dengue as a major risk factor for DHF/DSS has been shown to be associated with secondary immune responses to heterologous dengue virus serotypes due to antibody dependent enhancement (ADE) of virus replication. The ADE phenomenon has been shown to be effected by sub-neutralizing levels of antibodies to the envelope glycoprotein E which enhance virus replication in host monocytes via an Fc receptor mediated pathway. Thus in the search for a safe and effective vaccine against DHF/DSS, it is necessary to begin to design candidate vaccines which elicit protective immune responses without the risk of ADE. An understanding of the mechanisms of neutralization of dengue virus should guide efforts to plan a safe and effective vaccine and the second part of this paper describes the use of monoclonal antibodies to define suitable candidate epitopes for vaccine design and for diagnostic assays.

N.M. Asiah, B. Fazehah, I. Zuraini, H. Sharifah, S.V. Shirley & M.J. Cardosa,
Japanese encephalitis virus: Epidemiological studies in man and immune responses in mice to infectious and non-infectious immunogen
The Eight Veterinary Association Malaysia Scientific Congress, 23-25 August, 1996, Ipoh, Perak, Malaysia, pp 65-67

A study was undertaken to determine the percentage of Japanese encephalitis reactors in human blood donors from the Penang Hospital for one whole year from July 1993 to July 1994. A total of 8,080 serum samples were included in the study and the presence of specific IgG against Dengue virus (DEN) and Japanese encephalitis virus (JEV) was determined by the Dot enzyme immunoassay (DEIA) method at a serum dilution of 1:250. A percentage of 6.5% of the total number tested were found to have been exposed to JEV, while a total of 79% were tested positive to flavivirus. Only 8.2% of the flavivirus reactive population appeared to have stronger antibody response to JEV than to DEN. Plaque reduction neutralisation tests (PRNT) carried out on 10% of the samples showed 20% to have higher titres to JE as compared to Dengue, 62% having higher titers to Dengue as compared to JE and 18% having equal titers to JE and Dengue. PRNT titers on 10 of the sera that showed higher DEIA titres to Dengue as compared to JEV showed high corresponding Dengue PRNT titres to these

sera and low JEV titers. The immune responses to JEV infection in 3-4 weeks old BALB/c mice were studied by inoculating intraperitoneally with JEV at a dose rate of 3.5 x 105 PFU per 0.5mL. JE virus infected cell lysate at a dose of 0.5 mL diluted 1:5 with PBS was given to another group of mice. DEIA, PRNT and Western Blot analysis of the serum samples were carried out on the serum. Immune response was not seen in mice that received the cell lysate. Immunoperoxidase test was carried out on the organs of infected mice and the presence of antigen was seen in brain tissue.

Kua, C.S., Gudum, H.R., Katip, J.T. & Cardosa, M.J
A Study of Southeast Asian Ovalocytosis in the Serian Subdistrict, Sarawak
The 9th National Biotechnology Seminar. Penang, November 1997

Southeast Asian Ovalocytosis (SAO) is an autosomal dominant condition characterized by the presence of a large number of oval erythrocytes in the peripheral blood. In vivo evidence suggests that SAO confers some protection against malaria, due to the increased membrane rigidity of the ovalocytes. SAO is observed in many indigenous populations in Melanesia. In the attempt to establish the baseline of ovalocytosis incidence in different indigenous groups in Sarawak, 954 individuals from two lowland Bidayuh villages in Serian subdistrict were studied. Peripheral blood films revealed 11% of these individuals as ovalocytic. As illustrated by the pedigree, the majority (77%) of the ovalocytic individuals from Kampung Batu Bedang came from a few closely related families.

Aminah, S., Perera, D., Tio, P.H. & Cardosa, M.J
A comparison of two bacterial expression systems for the expression of dengue envelope protein
The 9th National Biotechnology Seminar. Penang, November 1997

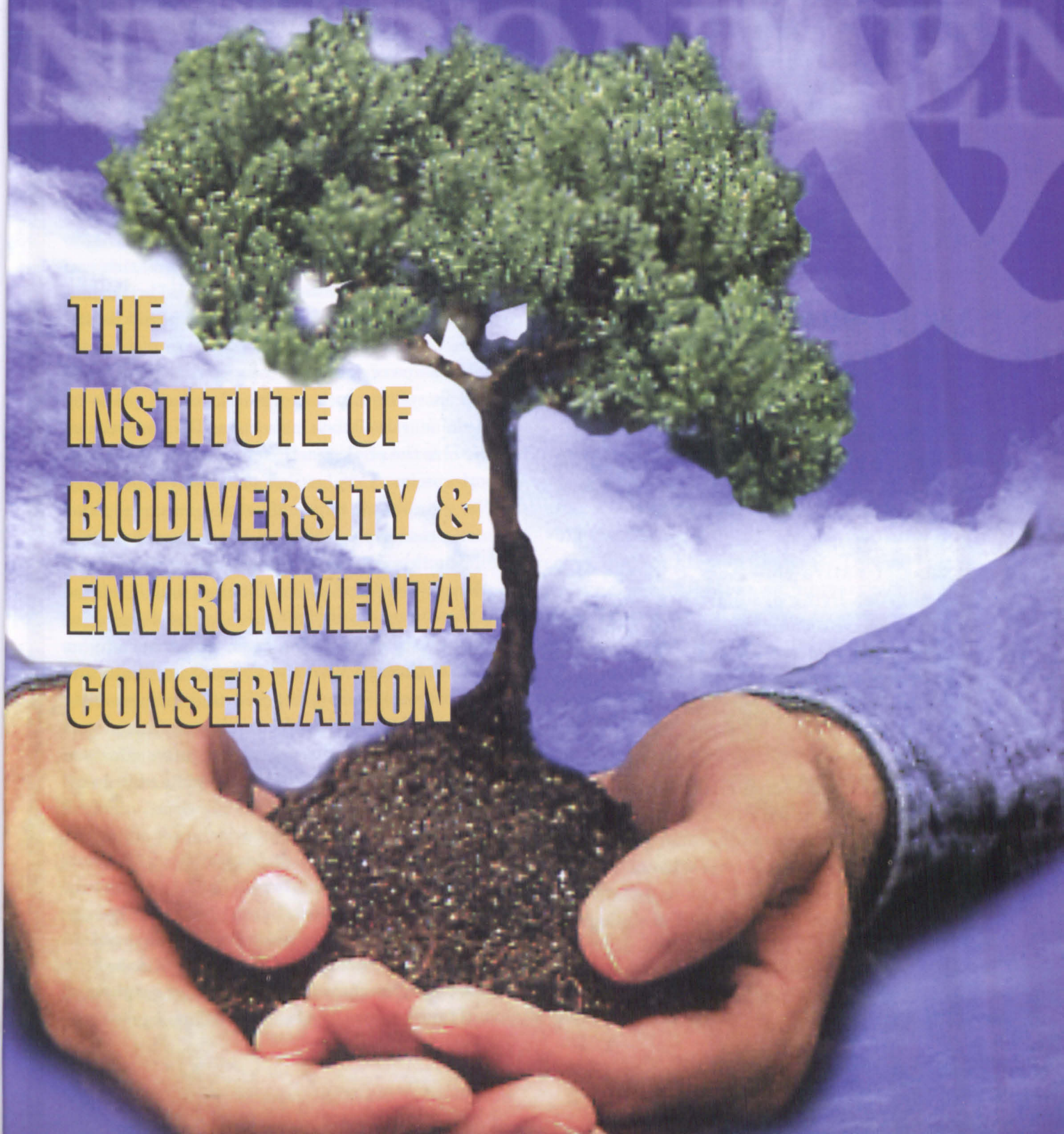
We have cloned a 5'-Hind III fragment of the dengue envelope protein gene in the pET32a vector and a 5'-BamH I fragment of the same gene in the pTrxFus vector. Expression of both products was detected by immuno-detection using monoclonal antibodies from this laboratory. An approximately 46 kDa and 44 kDa expressed product was detected for the pET and pTrxFus system respectively.

Leong, M.K., Abdul Karim Russ, Ghazally Ismail & Cardosa, M.J
Evaluation of Heat Stable B.Pseudomallei Antigens in a Dot Enzyme Immunoassay: Comparison with IHA
The 9th National Biotechnology Seminar. Penang, November 1997

The heat stable surface antigen of Burkholderia pseudomallei were tested with dot enzyme immunoassay technique on 205 single serum from asymptomatic army personnel based in Sarawak comprising 102 negative and 103 positive serum predetermined by indirect hemagglutination test (IHAT). The results from 102 IHAT negative serum with <1:40 showed 48/102 (47%) positive of which 35/102 (34.3%) were weak positive, 9/102 (8.8%) positive, 4/102 (3.9%) strong positive and only 54/102 (52.3%) were negative by dot enzyme immunoassay. However, from the 103 IHAT positive serum samples showed only 20/103 (19.4%) were negative of which 6/26 (23%) were from IHA titer of 1:40, 4/19 (21.1%) from IHA titer of 1:80, 9/25 (36%) from IHA titer of 1:160, and 1/16 (6.3%) from the IHA titer of (1:640. Higher rate of strong positive samples in 8/17 (47.1%) and 9/16 (56.3%) by dot enzyme immunoassay demonstrated from IHA titer of 1:320 and (1:640 respectively. Three culture positive melioidosis cases from post discharged patients showed very high titers of 1:100,000; 1:10,000 and (1:6000 in DEIA and IHA titers of 1:2560, 1:1280 and 1:1280 respectively. The study showed promising results for further utilization of dot enzyme immunoassay in seroepidemiological, surveillance and clinical melioidosis study.

INTRODUCTION

The Institute of Biodiversity and Environmental Conservation (IBEC) was formally launched in July 1994 with the appointment of the first Director, Prof John H Beaman. The main objective of the IBEC is to foster an understanding of the ecological principles and benefits that biodiversity holds for humanity. It also aims to promote the wise management and use of the nation's biotic wealth in ways that do not adversely affect the environment. Its teaching and research programmes are structured at the masters, doctoral and post-doctoral levels. Its research programmes promote the acquisition and dissemination of knowledge in priority areas of environmental science and technology. These programmes are geared towards establishing a body of dedicated natural resource managers, biological conservationists and environmental educators capable of contributing to the sustainable development of Malaysia's biotic wealth.



RESEARCH PROGRAMMES

Kinabalu Ethnobotany Project

In past decades, ethnobotany has blossomed into an important science because of the realization that a vast majority of knowledge on the utilization of our plant genetic resources is contained in our indigenous culture. The resurgence of interest in this area has been driven also by the urgency that ethnobotanical knowledge is being rapidly lost as natural ecosystems and cultures are being destroyed by the encroachment of development. Through the funding provided by the MacArthur Foundation of USA, UNIMAS in collaboration with the Sabah Parks, People and Plants Initiatives UNESCO and WWF-International has been spearheading a comprehensive people-participation research initiative called Kinabalu Ethnobotany Project (KEP) since 1993. The objectives of the KEP are: i. To collate, document and preserve indigenous knowledge of the Sabah ethnic communities pertaining to the use of our plant genetic resources; ii. To develop a herbarium collection at the Kinabalu Park of traditional plants used for medicinal purposes by the different ethnic tribes in Sabah; iii. To scientifically screen for chemical constituents of medicinal plants for potential development of drugs and iv. To heighten awareness and educate the public on the importance of preserving indigenous knowledge of plant genetic resources through community-based programme or people-participation project.

Dozens of native collectors from the Dusun communities living around the Kinabalu Park boundaries have been trained to collect, preserve and label plants under this programme. To date thousands of plant specimens were deposited at Kinabalu Park herbarium after they have been scientifically identified and labeled by a host of internationally renowned plant taxonomists visiting the Park. A computerized database is being developed and soon data from KEP will be made available to all scientists interested in researching the diverse plant genetic resources of Sabah, particularly the ethnobotanically important species from Mount Kinabalu. Scientists and students from UNIMAS have been actively engaged in screening for bioactive compounds from the plants collected in the KEP through collaborative effort of both local and foreign researchers.

The Flora of Mount Kinabalu Project

Professor John Beaman has been working on the flora on Mount Kinabalu since 1983. His taxonomic database now includes more than 20,000 specimen records representing nearly 4,500 species. The objectives of this Project are : *i.* To provide a scientific inventory for all vascular plants in the flora of Mount Kinabalu ; *ii.* To develop taxonomic databases that are accessible by international networks using the World Wide Web; *iii.* To document the locations of plants for use in the production of a comprehensive vegetation map of Mount Kinabalu. To date taxonomic treatments for about 30 percent of the nearly 4,500 plant species from Mount Kinabalu have already been published by Kew Royal Botanical Garden.

Gene Banking of Sabah Plants

Plant scientists throughout the world are in a race to preserve as much information as possible about the tropical plant species before many are driven to extinction. Although considerable information can be obtained through examination of dried herbarium specimens, much of the information required for the understanding of evolutionary and genetic relationships of species is contained in their DNA. In recent years much progress has been made by molecular systematists in the use of DNA techniques to resolve the phylogenetic relationships of tropical plant species. This has led to the development of DNA gene bank in an effort to preserve plant genetic resources. UNIMAS has initiated a DNA gene banking project focusing on the rare and endangered tropical plants of Sabah and also those that are purportedly effective as medicines for various ailments. DNA from plant specimens collected through both the Flora of Kinabalu and KEP projects were extracted and permanently archived at UNIMAS for future studies. This project is progressing well through collaborative efforts of Dr Teffy Beaman, Todd Barkman and Read Beaman of the USA.

The Geographical Information System (GIS) for Mount Kinabalu

UNIMAS has established a Geographical Information System (GIS) for Mount Kinabalu to monitor and analyze impacts on biogeography and plant taxonomy in the area. GIS technology is being

increasingly used by governmental and non-governmental organizations to evaluate and manage natural resources. In a GIS the various layers of information are stored as coverages. For Kinabalu, well developed coverages include topography, hydrology, the Kinabalu Park boundary, satellite imagery, plant communities and distribution of plant species. By establishing links between the floristic and spatial databases for Mount Kinabalu, UNIMAS hopes to promote experimentation and applications development for analytical use of GIS in plant taxonomy and biogeography.

Rain Forest Succession in Sarawak

The process of succession in tropical rain forests leads to the recovery of forest structure and composition after natural or human-induced disturbances. A detailed understanding of this process offers hope that tropical rain forest resources may be sustainably utilized well into the future. Studies in all areas of the tropics have begun to focus on the restoration and rehabilitation of degraded forests. In Malaysia the mechanistic processes driving forest succession are poorly known. A general pattern of succession on degraded land has been observed, involving short-lived pioneer trees followed by longer-lived pioneer trees and finally shade-tolerant late successional species. Succession is spatially and temporally extremely heterogeneous, so predicting the course of succession on a site, or choosing species to rehabilitate a site have proven difficult. We believe that a detailed understanding of secondary succession in Malaysian forests will only be gained by realizing the importance of processes functioning across a range of spatial and temporal scales. Studies are being conducted at landscape, community and species levels to determine the ecological constraints on the development of secondary successional rain forest in Sarawak: ***(i)*** Landscape studies: will determine the relative importance of broad-scale factors (e.g., soils, land-use history, climate) in controlling the development of forest regeneration using aerial photography and GIS analysis.***(ii)*** Community studies: will assess the influence of resource availability (e.g., soil nutrients) on vegetation composition and dynamics in the development of early successional communities. ***(iii)*** Species studies: will determine the limitations to individual species colonization of secondary successional sites (e.g., nutrient limitation, drought tolerance) using field and shade-house experiments

Ecology and Evolution in Macaranga

Macaranga is the most diverse and abundant secondary forest tree genus in south-east Asia. Detailed studies of the ecology and ecophysiology of *Macaranga* are being undertaken to further understand the dynamics of secondary forest communities in Sarawak. In addition to being a critical element of forest succession, many species form a symbiotic relationship with ants and are therefore an excellent object for the study of coevolution and cospeciation. Our research focusses on several inter-related areas and involves several international collaborations: the evolution of the ant-plant symbiosis using phylogenetic studies of morphology and DNA (with Kagoshima University, Japan); the taxonomy and biogeography of the *Macaranga* throughout the world (with Cambridge University, UK); and studies on the ecophysiology of *Macaranga* in early successional habitats.

Long-Term Ecological Research in the 52-hectare plot at Lambir Hills National Park

IBEC has recently become more strongly involved in the long-term ecological research project at Lambir Hills National Park (a collaborative research project involving the Sarawak Forest Department, Harvard University, the Smithsonian Center for Tropical Forest Science, and several Japanese universities). The 52-ha long-term ecological plot was resurveyed in 1997 and data on forest dynamics are currently being analyzed. National Science Foundation (USA) funding is being used to support UNIMAS student research activities in Lambir in 1998. Our major research interests with the long-term plot are to assess the dynamics of the pioneer tree species, and to use this information as a basis for understanding successional processes in degraded forests.

Smoke-Haze from Forest Fires

In 1997, fires in Indonesia burned an estimated 0.3 - 1.7 x 10^6 ha of forest, producing a cloud of smoke covering several million square kilometers over south-east Asia. Whilst the long-term effects of these

emissions on atmospheric composition and global processes are likely to be significant, less is known of their short-term effects on remaining tropical forest ecosystems. We have been monitoring the effect of smoke-haze on atmospheric pollution, climatic properties and levels of photosynthetically active radiation. The haze-induced short-term changes are expected to have both negative and positive effects on plant functioning in undisturbed forests. We conducted ecophysiological studies on several economically important indigenous tree species to assess possible impacts of the haze tropical forests

Integrated Coastal Zone Management Plan

During 1996 and 1997 and now in 1998 the research activities by the marine group at IBEC have focused on the Integrated Coastal Zone Management Plan (ICZMP) programme. Under the various projects, multidisciplinary teams conducted research relevant to biological, physical, environmental and socio-economic aspects of the coastal environment of Sarawak and Sabah. During this phase, secondary information from diverse sources, ranging from annual reports to departmental documents, have been gathered for use in the CZMP preparation. Many of these are largely unpublished, classified or restricted and were made available through multiagency involvement. Initial rapid assessment RACE surveys were carried out around the coasts to identify priority issues. Within a period of two years, the CZMP project has surveyed nearly the entire coastline of Sarawak and Sabah. A total of 104 sites were surveyed and 55 research sites were monitored to GCRMN standards and the results have been incorporated into Reef Check 1997, an International Year of the Reef project. At every research site a minimum of two transects were completed for each of two depths and for each of the four target organisms. Data was collected for corals and benthic life forms; fish species and abundance; macro-invertebrates and commercial fish species as well as for overall reef health and environmental threats.

Destructive and Unsustainable Fishing Practices in Sabah

One of the focus areas among the marine sciences is the effect of cyanide and blast fishing. IBEC researchers have established that the reefs of Sabah are under great stress, primarily as a result of these unsustainable fishing practices. Dynamite fishing is rampant and there are very few reefs without severe damage to the reef structure. Many reefs have less than 25% of their reef structure intact and most have an interconnecting series of bomb blast craters. Dead coral and rubble areas predominate and even recovering reefs are dominated by soft coral species. On bombed reefs, fish diversity is reduced to less than half and actual numbers of benthic living fish species were reduced to less than 10%. Fish size and population structure also change as a result of the damage to the corals: Only five out of 55 reefs had breeding sized adults for the most important commercial fish species. The most valuable commercial fish, humphead wrasse and large groupers, were only found at the two reefs protected by ecotourism. Invertebrates were also severely affected by the environmental damage. As well as the direct effects of blast fishing, invertebrates were being heavily collected, sea cucumbers, clams, triton shells and lobsters were all absent or reduced on all but a few reefs. Other invertebrate populations had expanded in the absence of competition or predators: Diadema urchins and Crown of thorns starfish had reached plague proportions on a number of reefs. The health of reefs around Pulau Sipadan after a recovery period of less than ten years is an indication that protected coral reefs can recover after bomb blast abuse. However, the reefs around much of the coast are unprotected and unless corrective measures are taken the fishery resources will no longer be available, leading to grave social and economic effects.

Role of Protected Marine Reserves in Conservation

Coral reef destruction and overfishing are commonplace in Southeast Asia due to expanding human populations and their needs, and the use of unsustainable fishery practices such as cyanide fishing and 'bomb' fishing. Current efforts to bring about change in these trends have remained largely ineffective due to inadequate or impossible enforcement, and a lack of appreciation on the part of the fishers on the consequences of their actions. Research by IBEC scientists along the coast of Sabah, East Malaysia, has shown that small, isolated

Marine Protected Areas have positive effects on the fisheries of nearby reefs, through the export of larvae and occasional juvenile and adult fishes. The same research has found, unfortunately, that much of the Sabah coastline is in dire need of immediate protection. Areas that are not protected have less than 20% of commercial fishes within selected families than what would normally be found irrespective of size class. Isolated protected reefs and islands are thus proposed to act as nursery areas to repopulate those that are currently overfished, with traditional or local reef ownership being the conduit toward effective enforcement of management guidelines. The ability to assign ownership is probably the only major stumbling block in the process.

Reef Check 1997 International Project

During 1997, the UNIMAS Expedition surveyed over 2500km of the coastline of Sabah, East Malaysia. The coast was surveyed from Semporna to Sandakan and then to Kudat and down to Kota Kinabalu as well as out to Pulau Layang Layang. With financial assistance from UNIMAS, Sarawak Shell Berhad, British Petroleum International, Japanese Bioindustry Association, British Council and others; the expedition leaders assembled a team of students and scientists who surveyed 59 sites at 28 separate reefs. This mammoth effort meant that UNIMAS contributed over 17% of all the sites in the world which were surveyed for Reef Check 97. At every site, two timed swims over approximately one kilometre each gave the overall picture of reef health and environmental threats, in addition to data on commercial fish species abundance. Data was collected for corals and benthic life forms; macro-invertebrates; as well as fish species diversity and abundance and is currently being analysed in a global context.

Crinoid Ecology and Systematics

Although crinoids are niether abundant or familiar organisms today, they dominated the Paleozoic era (over 250 million years ago). Fossil records exist of echinoderms and shallow marine habitats from the Permo-Triassic era (up to 50 million years later) after which they suffered a near complete extinction. While the crinoids were the dominant echinoderm of the Paleozoic with more than 6,000 described species, there are only 600 or so species living today. This small number of living representatives complicates the task of reconstructing a comprehensive phylogeny for the crinoids. Crinoid morphology reveals their echinoderm ancestry; they have the characteristic pentameral symmetry, calcareous plates, and the peculiar water vascular system with its associated ambulacral grooves and tube feet. The crinoid's links to the planet's past, and their poorly-understood symbiotic relationships with numerous crabs and shrimps were the catalysts behind a programme to monitor their movements in a demarcated zone on the reef, taking into account the type of substrate they chose to reside on and the movements, both overall and depth-related, that characterised their search for food. The research revealed interesting movement and avtivity patterns, which, had it not been for the lengthy monitoring period would have gone unnoticed.

Turtle Biology and Conservation

Possibly less well-known than the Leatherback nesting beaches in Trengganu, a small Park in Sabah, off the coast of East Malaysia in Borneo supports a large population of Green turtles and a moderate number of Hawksbills. Nesting trends over the past decade indicate a slight increase in numbers although marking efforts and tag-loss rates are unknown rendering the trend questionable. What is fact is that more than one thousand different turtles are tagged each year, suggesting either an extremely large population base, or a large tag-loss rate. Although little evidence points to tag-loss, current practices such as the use of only one tag and positioning on the front flipper suggest this may be a significant factor.The Malaysian nesting beaches are protected through research and monitoring efforts undertaken by Sabah Parks, who tag nesting females and collect basic morphometric data while transferring all eggs to a hatchery to avoid all forms of predation. These efforts have been underway since 1966, during which more than six million hatchlings have been released. The turtles have now been awarded even further protection through the establishment of the world's first trans-boundary marine park, in the establishment of the Turtle Islands Heritage Protected Area, straddling the Malaysian/Philippine border. On the 31st of May 1996, this protectorate came into effect with the signing of an agreement between the two

countries' Foreign Ministers. As such, the three islands that constituted Sabah's Turtle Islands Park and six islands in Philippine waters are now protected, as are the waters and coral reefs that lie within the outer perimeter of the whole group of islands.In the development of a comprehensive management scheme for the TIHPA, the fate of adult turtles are now being investigated as deleterious effects such as trawling and human consumption are common in the region. A worrying trend that has recently come to light is the lack of large numbers of returns from previous years, suggesting dramatic rate of 'removal' from the nesting population.

Seagrass Ecology in Sabah

The study of seagrass is now being incorporated into the general marine ecosystem research plan by the IBEC UNIMAS Marine Research Unit. As an important, yet simple community, the seagrass ecosystem provides a fascinating subject of study. Unfortunately seagrasses are all but extinct in Sarawak, undoubtedly due to the high turbidity resulting from river discharge. The last report of seagrass existing in Sarawak was made in 1970 one species was identified, *Halodule beccarii*, a relatively rare seagrass. This year the IBEC team discovered three species of seagrass in Lawas. Because they were found in small patches and at a low density, we think they represent either a remnant of the rest of the state's now dead seagrass community, or an attempt at re-distribution, helped by the thriving seagrass community in nearby Sabah. They were *Halodule uninervis, Halophila ovalis, and Thalassia hemprichii*, all three common Sabah species.The contrast between Sabah and Sarawak seagrass communities is dramatic. Eleven species from seven genera are found distributed all over the Sabah coastline, in areas of varying diversity. Follow-up studies will include seagrass mapping techniques, more in-depth investigation into seagrass distribution in Malaysian Borneo, and research in seagrass trophodynamics.

Giant Clam Populations in Sabah

From March to September 1997, the Seas of Borneo expedition team conducted a survey to determine the species distribution and abundance of giant clam stocks in several reefs of Sabah. Of the nine species of giant clam (Tridacnidae) known, six were found in the reefs of Sabah: *Tridacna crocea, T. maxima, T. squamosa, T. derasa, T. gigas and Hippopus hippopus*. The two most commonly found giant clam species throughout the areas surveyed were *Tridacna crocea* and *T. maxima*, while *T. gigas*, the largest and most endangered of the Tridacnidae family, was observed only as 7 individuals on Layang-Layang. Preliminary results show that, throughout the areas surveyed, the natural populations of giant clams have been severely decimated with the single exception of Layang-Layang. The average density of clams at Layang-Layang was 44 clams per hectare, as compared to 16 clams per hectare recorded in Kudat and Kapalai, and 11 clams hectare-2 at Pulau Mabul. Layang-Layang atoll is protected by it's isolated location and the Royal Malaysian Navy. There was also a significant reduction in clam size, as well as the reduced biomass. On all other reefs studied the uncontrolled harvesting has removed most of the adult clams from the reefs. Even Sipadan, a recovering protected reef has no *Tridacna clams*, and Layang Layang has a tiny remnant of a nearly extinct species. If giant clams stocks are to recover and *T. gigas* is not to become regionally extinct, then mariculture and restocking programmes for these reefs are the only way to restore the population to a viable breeding state.

Fiddler Crabs and their role in Environmental Monitoring

The purpose of this study is to investigate if and how anthropogenic activities in the surrounding areas affect the distribution and population of the fiddler crabs, and thus the ecology of the mangroves. This will be accomplished by extensive sampling from numerous sites along the coast of Sarawak, and by correlating water quality and the sediment chemistry and characteristics of each site to the distribution and population density of the crabs. The fiddler crabs, which are characteristic of mangrove fauna, have been chosen as subjects for this study as they are relatively sedentary detritivores, which feed on organic matter in the sediment. Therefore, they are sensitive to environmental pollutants and the composition of the substrate, and can be effectively used for environmental monitoring of the mangrove. This study will focus on the sensitivity of fiddler crabs to organic pollutants in the sediment and water column. Although the sampling for this study may not extend to the entire 2000 km coastline, extrapolation from the various sites and assumption based on similar

species communities in ecosystems with parallel distributions will provide a basis for comparison. It is postulated that marked differences in distributions and population densities of the fiddlers strongly indicate some degree of human impact. Such areas will be targeted for further study and investigation to determine specific causes.

Crustacean Ecology & Methods for Field Studies: Coral Banded Shrimp

A total of eight coral banded shrimp *(Stenopus hispidus)* from a single site were tagged using streamer tags, and their individual locations at the site were recorded over a period of 30 days. A grid was set up over the site dividing it into numbered 1 m2 quadrats, and each sighting was assigned a particular location and mapped accordingly, to provide an estimate of the home range for each individual. Home ranges were found differ significantly, ranging from 1-28.5 m2. It is postulated that the size of the home range affects the reproductive activities of these shrimp, drawing from a preliminary experiment by de Castro and Jory (1983). This is of commercial importance, as this particular species of cleaner shrimp is popular among aquarists. Streamer tags have been used on larger species such as lobsters and holothurians, but it is not known if they have been successfully used on subjects of this size. The tags were inserted into the dorsal edge of the abdominal muscle between the thoracic and the abdominal skeletons, above the intestine and the dorsal abdominal artery. Three out of the eight subjects were not sighted again after seven days; reasons for this are suggested. The tags did not seem to be hampering the movements of the shrimp, and two of the remaining five subjects were found to be carrying eggs after tagging. It is therefore assumed that the tags do not markedly interfere in their normal activities and behaviour, and can be suitably used in future experiments on crustaceans of this size.

Fish species diversity in relation to aquatic environment in estuaries and coastal zones of Kuching Bay, Sarawak.

The estuarine and coastal living resources in Sarawak support a very important fishery, providing not only gainful employment to many coastal inhabitants but the main source of animal proteins in the diet of the people and also gaining foreign exchange through the export of aquatic products. This Bay is one of the most productive fishing grounds of Sarawak and accounts for a substantial portion of the total fish landings. It is more heavily populated than the rest of the Sarawak and has been the focus of economic activities such as the establishment of industrial and residential estates, agricultural schemes and logging activities. These anthropogenic activities involving the exploitation of the ecosystem resources, adding nutrients, modifying habitat structure and adding contaminants could impose enormous pressure on the ecosystems that could cause significant impacts not only in sensitive habitat areas, but also in aquatic communities inhabiting them. In Sarawak, very limited studies have been conducted on fish diversity in relation to the estuarine and coastal environmental changes due to anthropogenic activities. This study has been designed to compare two selected sites in Kuching Bay with the assumption that one site (Batang Samarahan, Sungai Sarawak and their adjacent coastal waters) is much more disturbed than the other (Batang Kayan, Sungai Sampadi and their adjacent coastal watera). The study aims to document fish species diversity in the selected sites, and to relate it to physico-chemical aquatic environment, point or non-point sources of anthropogenic inputs from the adjacent land uses and as well as the estuarial features.

Economic valuation of natural resources

Borneo's natural resources and unparalleled biodiversity are often described as her biotic wealth. Yet for this wealth to be more than a metaphor requires translation into the language of economics. Economic valuation of natural resources bridges the gap between the ecology and the economy, incidentally both words being descended from the Greek word 'oikos', meaning 'home'. Economic valuation, by putting ecology in economic terms, provides an analytical method of ensuring we develop our 'home' in a cost-effective and sustainable manner. Research is underway to value the mangrove forests of Sarawak. Mangroves are valuable because they provide direct benefits such as wood for timber, firewood, and charcoal, nipah palm fronds for thatching, tannin, fish, and plants for traditional medicine. Mangroves are also a source of food and shelter for juvenile fish and shrimp which support coastal fisheries, as well as providing

erosion and storm protection to coastal lands. These values are very often neglected by policy-makers because they are not explicitly shown in markets. An economic-anthropology study is being carried out to value these benefits of mangroves and the associated labour and opportunity costs. This will provide policymakers with better information to compare development alternatives for the mangroves. The economic-anthropology study collects data from the local communities on the nature and use of mangrove products, their quantities, their prices (or the prices of any substitute products) to construct a demand curve for each product. In this way the benefits of each product can be valued. Similarly, research into the employment and economic livelihoods of the local people uncovers data on the labour and opportunity costs associated with the collection of mangrove products. The relationship between mangroves and coastal fisheries is also being investigated. A production function method will be used to value the benefits of mangroves to coastal fisheries.

A. PUBLICATIONS

Beaman, J.H. & Beaman, R.S. (1993) Diversity and distribution patterns in the flora of Mount Kinabalu, In Baas,P.*et al.* (eds) *The Plant Diversity of Malesia.* Kluwer Academic Publishers, Dordrecht, Netherlands. pp 147-160

Beaman, J.H. & Beaman, R.S. (1993) The gymnosperms of Mount Kinabalu. *Contr. Univ. Michigan Herb.* 19 ; 307-340

Beaman, R.S. 1991-93. Software. *KINABALU : A database management system for the botanical inventory of Mount Kinabalu.*

Parris, B.S., Beaman, R.S. & Beaman, J.H. 1993. *The Plants of Kinabalu, 1. Ferns and Fern Allies. 165 pp. Royal Botanic Gardens, Kew.*

Wood, J.J., Beaman, R.S. & Beaman, J.H. 1993. *The Plants of Mount Kinabalu*, 2. Orchids 411 pp. Royal Botanic Gardens, Kew.

Davies, S. J. 1996. The ethnobotany of Macaranga (Euphorbiaceae) among the Kedayan of Brunei Darussalam. *Brunei Museum Journal* .

Davies, S.J. 1997. Life-history evolution in early successional trees of Macaranga (Euphorbiaceae) in north-west Borneo. *American Society of Plant Taxonomists, 1997 Annual meeting, Montreal, Canada.*

Davies, S. J., Palmiotto, P., Ashton, P. S., Lee, H. S. & LaFrankie, J.V. 1998 Comparative ecology of 11 sympatric species of Macaranga in Borneo: Tree distribution in relation to horizontal and vertical resource heterogeneity. *Journal of Ecology, 86*

Davies, S. J. 1998. Tropical ecosystems: Environmental impacts.Biodiversity. Conservation in ASEAN: *Emerging Issues and Regional Needs.*(ed. G. Ismail & M. Mohamed), pp. 14-41. ASEAN Academic Press, London,UK.

Davies, S. J. (1998) Photosynthesis of nine pioneer Macaranga species from Borneo in relation to life-history. *Ecology, 79*

Davies, S. J., Edwards, D. S. & Booth, W. E. (1996) A botanical survey of the proposed Meragang Beach Recreation Park, Brunei Darussalam. *Brunei Museum Journal.*

Pilcher, N & S Oakley Unsustainable fishing practices: Crisis in coral reef ecosystems of South-East Asia.. In *Procs. Oceanology International 97 Pacific Rim*, 12-14 May, 1997, Singapore. 77-87

Oakley, S.G. The role of marine protected areas as a strategy for sustainable fisheries management., *Proceedings of Workshop on Aquaculture and Sustainable reef fisheries, Kota Kinabalu Sabah Malaysia 4-8 Dec 1996.*

Ismail, G., M Mohamed, S.G. Oakley, N.J. Pilcher IRPA Marine Communities Project 1997: The Use of Technology and Science for Marine Conservation, *Workshop on Malaysia- Japan research cooperation on conservation and sustainable use of tropical Bioresources. Kuala Lumpor Nov 10-12 ,1997.*

Oakley S.G., S. Enderby, N.J. Pilcher, G. Ismail. C. Digges, G. Mackey, R. Clubb, K. Atack, K. Stapleton, SM Toh, C. Huet, E. Morton. Marine community ecology, the effects of human impact in Sabah, East Malaysia. *Workshop on Malaysia- Japan research cooperation on conservation and sustainable use of tropical Bioresources. Kuala Lumpor Nov 10-12 ,1997.*

Oakley, S.G., N.J. Pilcher, C. Digges, S. Enderby, G. Mackey, R. Clubb, K. Atack, K. Stapleton, SM Toh, C. Huet, E. Morton Preliminary results of a 1997 survey of coral reef health in Sabah, East Malaysia.. *International Marine Science Conference, Terrenganu, Malaysia, 25-28th August 1997.*

Mackey, G, S. Oakley, N. Pilcher, C. Digges, R. Clubb, M. Keller, S.Enderby and K. Atack. The Geomorphology and General Characteristics of Pulau Layang Layang: A Remote Coral Atoll in the South China Sea. *International Marine Science Conference, Terrenganu, Malaysia, 25-28th August 1997.*

Pilcher, N.J., S.G. Oakley, G. Ismail, S. Enderby & G. Mackey The role of isolated protected islands and reefs in marine biodiversity conservation. *Pacific Science Inter-Congress : Islands In The Pacific Century. July 1997 Suva, Fiji Islands*

Ismail, G., N.J Pilcher, S.G. Oakley, M Mohamed, L. Ali 1996 Marine biodiversity conservation in Sabah: moving past the rhetorical stages In Ghazally *et al* eds. Biodiversity Conservation in ASEAN : Emerging Issues and Regional Needs. ASEAN Academic Publications: 165-186

Pilcher, N. 1996 Marine biodiversity conservation in Sabah and Sarawak: an integrated approach, *International conference & workshop on conservation and Biology 20-23rd Kuching Nov 1995*

Oakley, S.G. Facing facts, changing the emphasis of curricula to reflect the reality of global pollution control, *20th WEF Conference on Education and the Environment Kuching July 1996*

Pilcher, N.J & L. Ali 1996 Malaysia/ Philippines trans-boundary marine park; a monumental step towards Marine turtle conservation.. In *Proc. 17th Annual Sea Turtle Symposium, Hilton Head South Carolina NOAA Teoh Memo: 273-274*

Oakley, S., 1997 International year of the Reef and Reefs in Crisis: Fact or Fantasy. *Aquatic Survival,* Vol 6, #2

Oakley, S., N. Pilcher, G. Ismail, S. Enderby, C.Digges, C. Huet, T. Morton, Su Mei Toh, G. Mackey, R. Clubb, K. Atack, K. Stapleton, R. Cooke, S. Smith Coral Reef Destruction in Sabah: *Workshop on Malaysia- Japan research cooperation on conservation and sustainable use of tropical Bioresources. Kuala Lumpur Nov 10-12 1997.*

Oakley, S., N. Pilcher, G. Ismail. Roxann, a remote sensing tool for benthic marine community surveys *Workshop on Malaysia- Japan research cooperation on conservation and sustainable use of tropical Bioresources. Kuala Lumpur Nov 10-12 1997.*

Oakley, S. Black Coral Biodiversity in Sabah, East Malaysia *Workshop on Malaysia- Japan research cooperation on conservation and sustainable use of tropical Bioresources. Kuala Lumpur Nov 10-12 1977.*

Pilcher, N. Aspects of the ecology of the Crinoids of Layang Layang *Workshop on Malaysia- Japan research cooperation on conservation and sustainable use of tropical Bioresources. Kuala Lumpur Nov 10-12 1977.*

Huet, C and Smith Estimating the Home Range of the Coral Banded Shrimp Stenopus hispidus, using Streamer Tags *Workshop on Malaysia-Japan research cooperation on conservation and sustainable use of tropical bioresources. Kuala Lumpur Nov 10-12 1977.*

Toh, SM Giant Clams of Sabah: Distribution and Abundance *Workshop on Malaysia-Japan research cooperation on conservation and sustainable use of tropical Bioresources. Kuala Lumpur Nov 10-12 1997.*

Morton, E. D. III Seagrasses of Layang Layang: Abundance, Distribution, Productivity, and Biomass *Workshop on Malaysia- Japan research cooperation on conservation and sustainable use of tropical Bioresources. Kuala Lumpur Nov 10-12 1997.*

THE INSTITUTE OF EAST ASIAN STUDIES

INTRODUCTION

The Institute of East Asian Studies was launched officially early in 1998, as part of the fifth anniversary celebrations of Universiti Malaysia Sarawak. UNIMAS established a research Institute of East Asian Studies, to take advantage of the university's strategic location and to encourage a deeper understanding of current and projected change in the regional and global socio-economic environment. The Institute is the first of its kind to be set up in an ASEAN country. Its role is to stimulate and to coordinate a range of interdisciplinary programs and activities to advance a better understanding of the evolving political economy of the East Asian region in a global context, taking into account the social, cultural, religious and historical character of the nations, states and civilisations in the region. The programs of the Institute focus upon Malaysia in the context of Southeast and Northeast Asia, of a dynamic region that is challenged by the impact of globalization and the consequences of fast economic change. The East Asian region is made up of countries determined to pro-actively shape their own future for the new millennium.

1997 has been the planning phase, during which the research focus of the Institute was established, and external funding successfully obtained. The Institute has initiated an active seminar program. Work-in-progress papers have been delivered by 11 overseas scholars, plus 6 of our own UNIMAS staff. Wherever possible these seminars have been held in conjunction with the relevant UNIMAS faculty or Research Institute. Participants in these seminars have included the State Secretary, the Chairman of the University Council, the Chaiman of AZAM, the Directors of the Sarawak Museum and the Sarawak Development Institute, the Secretaries of the Dewan Undangan Negeri and of the Majlis Adat Instiadat, plus key community figures such as Tan Sri Ong Kee Hui.

Establishing vibrancy as a research institute is based upon the vitality of scholarship, hence the importance accorded to initiating an active seminar program. A list of the 1997 and 1998 seminars follows.

RESEARCH PROGRAMMES

Although various aspects of traditional societies have been investigated, with rich results, there are a number of aspects facing contemporary Bornean and East Asian societies that warrant close examination. These include:

- regional development in the ASEAN nations, particularly in the East Asian Growth Area;
- analysis of capital and resource and information flows;
- internal migration within the region, and the flow of population across national borders;
- issues of employment creation and income distribution, particularly for those residing in the rural areas;

- sustainable development and resource use;
- the revitalization of coastal communities, fully utilising the human potential and available economic resources;
- issues pertaining to evolving identity, within the context of Sarawak, Malaysia, and the region, into the 21st century;
- relations between the various indigenous peoples, with the coastal and urban groups, and with new settlers from other regions;
- the unique diversity of the immigrant communities in Sarawak, taking cognisance of the varying manifestations of region and dialect;
- the international dimension and global perspective of the various communities, and linkages forged in the context of Malaysia's regional outreach;
- recent political developments and the role of parties both as unifying and divisive forces.

Chair of Dayak Studies

The Dayak communities are a critical component of the population of Sarawak in particular, and the island of Kalimantan/Borneo as a whole. For many years study of Dayak cultures, languages, history, religion and society has been carried out under the auspices of the Sarawak Museum, the Tun Jugah Foundation and the Majlis Adat Istiadat.

The Dayak Cultural Foundation agreed to endow a Chair of Dayak Studies at UNIMAS so as to ensure that there will be continuing and long term research focusing on issues confronting the Dayak communities. Thus on 16 March 1998, the Chief Minister of Sarawak officially launched the Chair of Dayak Studies in UNIMAS.

The Chair of Dayak Studies would have clear benefits for the Dayak communities. Firstly, it is a recognition of the importance and unique position of the Dayak peoples in Sarawak and Borneo/ Kalimantan. Secondly, through the establishment of the Chair of Dayak Studies, the Dayak Cultural Foundation wishes to assist with further study of the range of critical issues facing the Dayak peoples as they enter the new millenium.

Research in the field of contemporary Dayak Studies will contribute to an understanding of:

- Issues of employment creation and income distribution, particularly for those residing in rural areas;

- Issues pertaining to the role and identity of the Dayak peoples, as they enter the 21st Century; and

- Relations between the various Dayak peoples, with the coastal and urban groups, and with new settlers from other regions.

The Nusantara Chair

The University has been promised the endowment of a Nusantara Chair, which would stimulate research pertaining to the revitalization of coastal communities; recent political developments and the role of parties both as unifying and divisive forces amongst the coastal peoples; and issues of evolving identity, within the context of Sarawak, Malaysia and the region.

Chair of Sino-Bornean Studies

This Chair will focus upon research that contributes to an understanding of the unique diversity of the Chinese community in Sarawak, taking cognisance of the varying manifestations of region and dialect; the economic and political contributions of the community to the development of both state and nation since World War II; and the international dimension and global perspective of the community, and linkages forged in the context of Malaysia's regional outreach.

Series of Research Seminars

Topic

17 April 1997
China after Deng: Prospects for the 21st Century **
Prof. David Goodman
Univ. of Technology, Sydney

22 May 1997
Explaining Asiaís rapid economic growth
Mr. David Brown
Univ. of Washington

30 June 1997
Social networks of entrepreneurs in Taiwan and Korea
Dr. Sallie Yea
Univ. of Victoria

18 July 1997
Agricultural development and resource conservation in the Philippine uplands
Dr. Robert Cramb
Univ. of Queensland

22 July 1997
Contemporary Chinese politics in three Malaysian states: Penang, Kelantan and Sarawak *
Mr. Michael Goldman
Univ. of California, Berkeley

22 July 1997
Ethnic identity in urban Sarawak
Dr. Clare Boulanger
Mesa State College

7 August 1997
The Mahathir era: A perspective on leadership style
Dr. James Chin
Middlesex Univ.

14 August 1997
Regional security in an expanded ASEAN: A new framework
Dr. Aderemi Isola Ajibewa
Universiti Malaysia Sarawak

15 August 1997
Masa Jepun (The Japanese period in Sarawak)
Assoc. Prof. Bob Reece
Murdoch Univ.

22 August 1997
Current research in mental health in Kuching area *
Ms. Sara Ashencaen Crabtree
Universiti Malaysia Sarawak

11 September 1997
Leadership change in Indonesia
Prof. Michael Leigh
Universiti Malaysia Sarawak

18 September 1997
Malayness and nationalisms in Southeast Asia: Malaysia, Indonesia and Brunei ***
Prof. Anthony J.S. Reid
Australian National Univ.

2 October 1997
The study of Malaysian economic history
Dr. John Drabble
Univ. of Sydney

13 October 1997
ASEAN 10: The future?
Ms. Nooríain Aini
Universiti Malaysia Sarawak

16 October 1997
Chinaís impact on the post-cold war strategic environment
Mr. Ahmad Nizar Yaakub
Universiti Malaysia Sarawak

6 November 1997
Sarawak and Sabah in the Malaysian economy
Ms. Wee Chong Hui
MARA Institute of Technology, Sarawak, Malaysia

18 December 1997
The unfashionable Iban: Sebuyau of Lundu
Dr. Otto C. Steinmayer
Universiti Malaysia Sarawak

8 January 1998
The territorialization of environmental discourse in Indonesia
Dr. Nancy Peluso
Univ. of California, Berkeley

13 January 1998
You donít know anything about me: A sea turtleís view of mankind and its ways
Mr. Nicolas Pilcher
Universiti Malaysia Sarawak

5 February 1998
Golden threads and glinting daggers: Acehnese material culture
Dr. Barbara Leigh
Univ. Technology Sydney

21 March 1998
Quality of work and family life: Explorations in East Asia
Dr. Jose C. Gatchalian
Universiti Malaysia Sarawak
Prof. Miflora M. Gatchalian
Secretary-General of the Asia Pacific Quality Organization

23 April 1998
Nonviolent struggle for democracy in Burma
Dr. Mikio Oishi
Universiti Malaysia Sarawak

27 April 1998
Environmental management in Brunei Darussalam
Prof. Peter Eaton
Universiti Brunei Darussalam

8 May 1998
Issues of interagency communication in the IADP Kalaka-Saribas
Dr. Dimbab Ngidang
Universiti Malaysia Sarawak

14 May 1998
The 'ASEAN Way': Rhetoric or reality
Ms. Suseela Devi Chandran
Universiti Malaysia Sarawak

21 May 1998
The Indonesian Crisis
Prof. Michael B. Leigh
Universiti Malaysia Sarawak

10 June 1998
Putting dollars and 'sense' to nature: An economic valuation of Sarawak's mangroves
Mr. Anthony Kong
Universiti Malaysia Sarawak

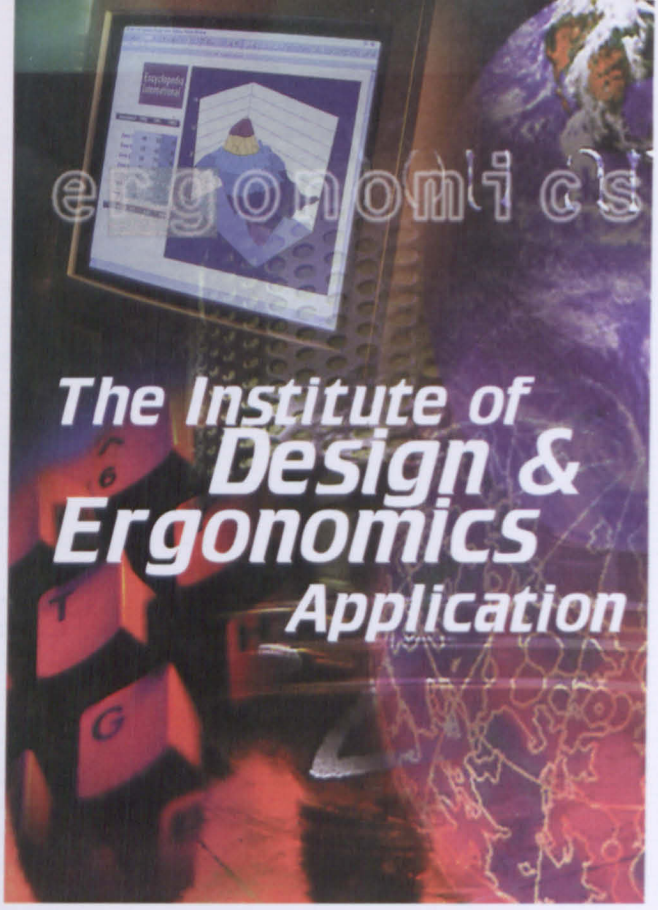
12 June 1998
Movements of international reserves under conditions of monetary disequilibrium
Prof. M.G. Kanbur
Dr. Rujhan Mustafa
Ms. Mahani Mohd. Abdu Shakur
Universiti Malaysia Sarawak

15 June 1998
Yayasan Karya Sosial Pancur Kasih (YKSPK) dalam Gerakannya: Pemberdayaan Sosial-Ekonomi Rakyat Menuju Hidup yang Merdeka
Mr. A.R. Mecer
Ms. Ita Natalia
Yayasan Karya Sosial Pancur Kasih, Pontianak

17 June 1998
Monster Houses, Yacht Immigrants, and the Vancouver Sun: Media, Ethnicity and Chineseness in a Canadian Context
Dr. Wanning Sun
Southern Cross University

18 June 1998
Tino Rangatiratanga and the historical construction of Maori identity
Mr. Kevin Egay
Universiti Malaysia Sarawak

25 June 1998
The East ASEAN Growth Area: Rhetoric or Reality?
Dr. Pushpa Thambipillai
Univ. Brunei Darussalam



INTRODUCTION

It becomes apparent as we approach the 21st century that the requirements of industry and the community are now more complex and demanding than ever before. The nature and complexity of today's problems require a macroergonomics approach - an integration of many techniques by a rich interdisciplinary approach. Within such an approach, what ergonomics has to contribute is essentially a technology for changing behaviour to that which offsets the problems. Problems such as automation, occupational health, and industrial accidents, certainly require massive technological research and development (R&D) for their solution. Generalization from ergonomics research conducted elsewhere to those of developing countries with different cultures cannot be seen as normative nor a matter of one-to-one direct transfer.

The role of ergonomics in the design process is to support the user community. Ergonomics and Human Factors knowledge must be fed early in the design and development process to produce usable systems. This approach is particularly lacking in Malaysia, hence local products do not have the comparative advantage in world markets where ergonomic practices are well established. Designing for effective, productive and safe human use becomes the prime goals of ergonomics. The complementary and integrating role of design and ergonomics in product and system development aptly describes the role of IDEA.

IDEA's role is two-pronged: First, to support the development of ergonomics and design capabilities in Malaysia. Presently, this is being achieved through providing professional training to industry in the form of short courses, and later through postgraduate training. The bridging short courses serve to provide basic knowledge in ergonomics, and in the future, to catalyse research when there is sufficient level of ergonomics design capability. Second, to promote and enhance R&D capability through inter-disciplinary links and international networking in niche area research (see Research Programmes). The need to advance both design and ergonomics methodologies through R&D activities will help to support competitiveness of local products and services in the global market.

Collaboration with national agencies, such as SIRIM Berhad, National Institute of Occupational Safety and Health (NIOSH), Malaysia Design Council and Malaysia Design Technology Centre, has focused primarily on professional training to help raise ergonomics awareness. In the future, greater collaboration will be in R&D in design-related issues. In addition, cooperation with international bodies and institutions such as the International Ergonomics Association (IEA); The Southeast Asian Ergonomics Society (SEAES); University College London, United Kingdom; Linkoping University, Sweden; and the Fraunhofer Institute of Industrial Engineering IAO, Germany, helps to internationalise IDEA's R&D initiatives.

RESEARCH PROGRAMMES

Usability Studies

Usability is still a buzzword in Malaysia and is yet to be implemented on a major scale. Elsewhere in the world, usability is regarded as an important concept in determining that systems are usable, and meeting user and system requirements. Therefore, this programme encourages research into:

- Emerging and enabling technologies, such as multimedia, videoconferencing, virtual reality, and speech recognition in various applications, including CSCW.

- Evaluation of user interfaces of human-machine systems from training, consumer to industrial systems.
- Product design

Human-Machine Interaction

The problem with poor design of human-machine systems is the effects on human and task performance. As a result, Human-Machine Interaction (HMI) has become a growing field with research activities encompassing task analysis, human reliability, error analysis, assessment of work systems, functional allocation between human and machine, and safety aspects of work and environment. These issues require much input from both the social and behavioural sciences, especially cognitive and social psychology, communication studies and organisational behaviour. The programme will motivate research into:

- Human performance: anthropometeric and biomechanics of performance, error studies, work stress and mental load, manual materials handling.
- Macroergonomics and TQM: quality and work productivity, organisational modelling.
- Allocation of functions: public information systems, intelligent systems.
- Safety: workplace hazards, transport safety.

Some of the early work on traffic safety included a survey of road user behaviour among drivers and motorcyclists in the Klang Valley. The study funded by the Ministry of Transport, Malaysia, is aimed to enhance driver training programmes and public awareness on road safety given the high incidence of road accidents among Malaysians. Another study on the design of safety helmets for motorcyclists has serious implications on quality and safety standards. Other efforts included studies on shiftwork and functional allocations of tasks in postal sorting. Further research will examine the effects of stressors in high-technology work environments, and the design of work spaces in modern offices, including virtual ones.

Design Studies

Design is ubiquitous in systems development. Design methodologies that address local requirements are required to support design of user-centred systems that are tailored to the Malaysian population. Research into computer-aided designs (CAD) will be much emphasised in this programme, besides the following:

- Design methodology: CAD design, participative design, design guidelines for multimedia and speech interfaces, design for manufacturability.
- Database design: antropometric database, data mining.
- Cultural diversity issues in product design.

Some prior work in speech recognition and CAD tasks have been undertaken which will prove beneficial in the future developments of these technologies to support industrial and related applications. Cross-cultural studies of user interfaces will be another area that warrants further investigation.

RESEARCH COMMUNICATIONS

A. PUBLICATIONS

Halimahtun M. Khalid and P.C. Ooi, 1996. Effects of motorcycle helmets on task performance and user acceptability.
Vision in Vehicles - In A.G. Gale, I.D. Brown, C.M. Haslegrave and S.P. Taylor (Eds.),V. Amsterdam: Elsevier Science, Vol. 5, 363-370.

The incidence of motorcycle accidents in Malaysia is a growing public health problem. A majority of the accidents incur head injuries to victims despite wearing safety helmets. This study attempts to investigate the usability and acceptability of full face and open face helmets as protective devices. Subjects performed three basic skill competency tasks that differed in complexity levels while using both helmet types. A baseline condition was included for control purposes. The results indicated highly significant effects of helmet wear on task performance, with greater performance decrement when using full face than open face helmets. This may be attributable to restriction of the vertical visual field as established in past studies. Also, there were significant effects of helmet use on design suitability and comfort, with full face helmets being less ergonomically effective relative to open face. The findings imply the need for adequate enforcement of quality standards in the design and manufacture of safety helmets.

Halimahtun Mohd Khalid, 1996.
Human factors in multimedia; towards developing multimedia capability.
Human Factors in Organizational Design and Management - In O. Brown Jr. and H.W. Hendrick (Eds.), V, Amsterdam: Elsevier Science, Vol. 5, 119-124.

The recent availability of multimedia computing technologies provides users with opportunities to design multimedia documents, and to communicate information in a more effective way, thus departing from the text-oriented communication style. While such opportunities exist, the demands of producing a multimedia document have been underestimated. This paper addresses some human factors issues in designing multimedia presentations and the problems associated with developing multimedia capability. The paper draws upon findings from multimedia studies that are conducted at UNIMAS and those in the literature.

Halimahtun M. Khalid and Martin G. Helander, 1997.
A design framework for cooperative telelearning
Proceedings of the 13th Triennial IEA Congress, IEA'97. Tampere, Finland: Finnish Institute of Occupational Health, Vol 1, 378-380.

In today's knowledge-based and networked society, telelearning, both a technology an social innovation, provides an environment for cooperative learning that is not easily achievable in conventional classrooms. By linking the learner and instructor through telematics, dynamic and current knowledge structures may be accessed in ways that traditional open learning systems do not permit. The change in locus of control from instructor to learner, however, raises a series of hypermedia issues about cognition, motivation and navigation which need to be explored in reconceptualising current telelearning systems. Many design features of telelearning systems have not been driven by the needs of the user in performing the task effectively, but more so by what is technically feasible. A framework is needed to understand what is most characteristically 'human' and user-centred about telelearning. In this paper we provide a systematic framework for the design and evaluation of multimedia telelearning systems to support cooperative learning tasks. We also highlight some interpersonal communication issues which may have serious implications on design of such systems.

Halimahtun M. Khalid, 1997.
Human factors in multimedia production
Proceedings of the 13th Triennial IEA Congress, IEA'97. Tampere, Finland: Finnish Institute of Occupational Health, Vol. 5, 17-22.

Multimedia production is still a relatively new and expanding domain with no clearly understood rules or know-how that can be shared among multimedia developers. While there are many types of multimedia applications (e.g. education-on-demand, information kiosk, etc), there are various styles and methodologies to accommodate the different requirements of these applications. This paper presents some human factors issues in multimedia production, in the context of developing an interactive multimedia information ware entitled UNIMAS Digital Gallery. Emphasis will be given to the overall design and content objectives of multimedia production rather than on the technological issues. The latter will only be discussed insofar they are relevant for understanding issues in multimedia design and application.

Halimahtun M. Khalid, 1998.
Human Factors of IT-based solutions for Worldwide Manufacturing Web ***Manufacturing Agility and Hybrid Automation-II, In W. Karwowski and R. Goonetilleke (Eds.), Louisville, USA: IEA Press.***

Malaysia's Multimedia Super Corridor (MSC) is a regional technology hub and a launch site for companies developing or using multimedia technologies to enhance their Asian presence. MSC makes it possible to provide value-added products and services to customers in various so-called "flagship" applications which includes worldwide manufacturing web (WMW). The latter can be conceived as multi-site agile manufacturing where companies - both real and virtual - contribute to the activities in the life cycle of product development and manufacturing through distributed functions. Several manufacturing functions including design, production planning and control, engineering support, and marketing and sales may be performed by different companies throughout the world. This paper describes some of the features of WMW based on agile, distributed and virtual manufacturing paradigms. It also addresses human factors issues in implementing IT-based solutions in the WMW.

Halimahtun M. Khalid, 1998.
Multimedia usability and its implications for ergonomics
Proceedings of The Global Ergonomics Conference '98. Amsterdam: Elsevier Science.

Multimedia interfaces are an established part of the human-computer interaction repertoire as it raises issues concerning navigation methods and organisation principles that are important in HCI. Just as there is no standard definition of multimedia, little is also known about how to design usable multimedia interfaces. To date, there are relatively few guidelines that can be shared among multimedia developers. While not much empirical research exists that can support the many design guidelines found in the literature, the need to apply a certain structure seems inevitable for the design of multimedia. This paper discusses the issue of multimedia usability in the context of developing a CD-ROM title Ergonomics in Design which adopts the participative design approach.

Halimahtun Mohd Khalid, 1996.
Effects of shiftwork and visual display terminal on women's health and work performance.
Industrialization and Women's Health, In Hing Ai Yun (Ed.), Singapore: Singapore Council of Women's Organisations, 205-224.

Studies on women at work are far less numerous than those on men, and well-based comparisons of ASEAN women are fewer still. This chapter seeks to address the above concern in four parts. The first part describes the changing trends in development that led to women's participation in industries. The second and major part examines the application of shiftwork and new technology in the workplace as a by-product of the changing trends in industrial development and computerisation. The third part discusses a small-scale study that investigates the phenomenon of shiftwork and VDT use, particularly their effects on women's health and work performance. The final part attempts to draw out the likely implications of this research for the future and identifies some solutions pertaining to women-at-work studies and other related issues.

B. CONFERENCE AND SEMINAR PRESENTATIONS

Halimahtun Mohd Khalid.
Understanding road user behaviour: patterns and modifications.
The Conference on Asian Road Safety 1993, CARS'93, Crown Princess Hotel, Kuala Lumpur, Malaysia, 25-28 October, 1993.

This paper addresses the problem of road user behaviour in Malaysia with special focus on drivers and motorcyclists. The contribution of human factors to the problem of road accidents and the need for a theoretical understanding of road user behaviour is discussed in the first part of the paper. The second part reports the findings of a survey amongst Malaysian road users in the Klang Valley region, in terms of three behavioural tendencies: personality traits, attitudes and perceived risk. This study showed significant relationships between traits, attitudes and risk through correlation analyses, and highly significant differences between drivers and motorcyclists on these behavioural measures through ANOVA analyses. On the basis of these findings, the third part identifies global intervention strategies, in the form of enforcement, education and engineering as countermeasures in modifying individual road user behaviour.

Halimahtun Mohd Khalid.
Human factors in road safety development: problems and prospects.
The ASEAN Inter-varsity Conference, Faculty of Development Science, Universiti Kebangsaan Malaysia Sabah, Sabah, Malaysia, 12-15 November 1993.

It is widely acknowledged that road accidents have emerged as a major public health problem in the ASEAN region. Studies on accident rates and accident costs showed that the social and economic burden of road accidents was comparatively heavier in developing countries than in more developed motorised ones. Rapid movement towards a more global economy tended to have a consequential impact on population mobility and vehicle ownership, resulting in higher motorisation levels. Clearly, effective and low cost countermeasures are needed in the short-term. These countermeasures involve several fields of action and institutional coordination. The present economic conditions in ASEAN countries call for a more rational and efficient approach given its history of safety

practice. Barriers to road safety enhancement include culture, institutions, philosophy, and knowledge. It becomes imperative to understand the human factors of local conditions, relevant to the production of reliable safety programmes, which may be accomplished through planned and systematic multi-disciplinary research. This paper attempts to address the problems of road safety in Malaysia, and the prospects of improving it. Discussion will impact on education, engineering and enforcement issues, in relation to an on-going road user behaviour study.

Halimahtun Mohd Khalid.
Social marketing of ergonomics - a framework.
The Third Afro-Asian Psychological Congress, Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia, 23-26 August 1994.

Ergonomics has not taken off in Malaysia and in the ASEAN region, at the same pace as its sister disciplines in psychology, especially developmental, social, counselling. The psychological difficulties of marketing ergonomics include inadequate human factors and infrastructural support. Attempts to influence societal behaviour have been largely based on the traditional methods of education and information. To increase knowledge transfer, it becomes necessary to apply new methods. Marketing offers an opportunity and a challenge; in social marketing, the "consumer" is often not as keen to co-operate as in the commercial sector. Thus, social marketing is more than simply imparting information or knowledge. It is motivated by a social goal such as safety, improved productivity, efficiency and well-being, which essentially are ergonomic goals. On the basis of this philosophy and findings from past ergonomics research, the paper suggests a framework for the social marketing of ergonomics that is yet to be tested on the home front.

Halimahtun Mohd Khalid and Azman Mohd Hussein.
Globalization of education and training: emerging challenges and institutional responses.
The PSSM-USM Conference on 'Globalization: Local Challenges and Response,' Universiti Sains Malaysia, Penang, Malaysia, 20-21 January 1995.

The growth of telecommunication networks is changing the image of the classroom. The global classroom has become a point of focus for the education restructuring movement. The benefits of globalisation, such as increased access to education, shared costs and improved quality through shared expertise, seemed apparent. However, the transformation to a mass global culture may result in experiences, knowledge and skills becoming universal and generic. International programmes using telecommunications-based distance education face serious problems in terms of lack of available facilities, difficulties of access and the pricing of these services. The first part of this paper describes the present scenario of globalisation in education and training; the second part discusses technological and pedagogical issues associated with the phenomenon, and the third part describes the responses of two local institutions - UNIMAS and CELCOM - in developing respective action plans to support open learning.

Halimahtun Mohd Khalid.
Multimedia technologies and future work systems.
The International Symposium of Future Developments in Human Work Systems, Yokohama, Japan, 27-28 June 1996.

This paper explores ideas through which educational programmes can be provided in an open learning environment to support both on-campus and work-based learning using multimedia technologies. It examines the link between the learner, educator and multimedia technology which facilitates communication over the link. Ergonomic issues at the human-technology interface that address effective telelearning are discussed. This includes design of task, multimedia information and electronic learning environment that constitutes a human-centred worksystem. Future worksystems that support individualized self-access and collaborative learning are mentioned to highlight possible new methods in information access and control. It also suggests the need for further research into multimedia worksystems as a function of cultural diversity.

Halimahtun Mohd Khalid.
Cooperative evaluation of video conferencing technology in distance teaching-learning.
The Fifth International Symposium on 'Human Factors in Organizational Design and Management', Breckenridge, Colorado, USA, July 31- 3 August 1996.

Video conferencing technology is one generic application of telecommunications-supported

education. Its implementation requires understanding sociotechnical issues at different encounter levels of the human-technology interface. This paper presents an online case study of assessing technology transfer using a cooperative evaluation technique. It involves the users, support operators and system providers in a participatory context. Firstly, it examines the link between the technology provider and the client in implementing the video conferencing system. Secondly, it examines usability issues in the delivery process between instructor and learner in real distance teaching-learning of an Educational Technology module offered by the Centre for Applied Learning and Multimedia. Evaluation of the processes reveals the problems of technology transfer due to lack of sociocultural understanding between the system developer, technology provider and clients. The problem is further aggravated by inadequate infrastructural support at the national network level. The analyses also revealed the importance of telepresence in videocommunications which helps to enhance realism of the teaching-learning process.

Halimahtun Mohd Khalid.
A framework for capability building through telelearning.
The Conference on Distance Education, USM, Penang, Malaysia, 27 February-1 March 1997.

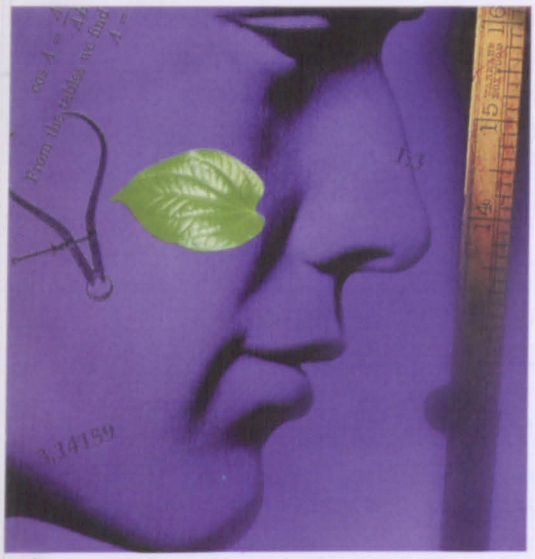
Telematic-based learning is widely implemented as part of the massification of education philosophy, providing a context for capability building in today's networked and knowledge-based society. However, technical limitations of the equipment used in today's teleconferencing systems seem to impede the uptake of telelearning. These systems could not support complex and informal communication tasks, such as teletutoring and telemeeting, effectively. This paper presents the use of telelearning technology in developing learner capability. A framework to support cooperative telelearning is described which also supports research into design of better telelearning systems. The critical success factors in telelearning are discussed to highlight the need for a macroergonomics approach in establishing telelearning partnerships. Finally the UNIMAS telelearning project is presented to illustrate the need for research into telelearning systems over high speed network.

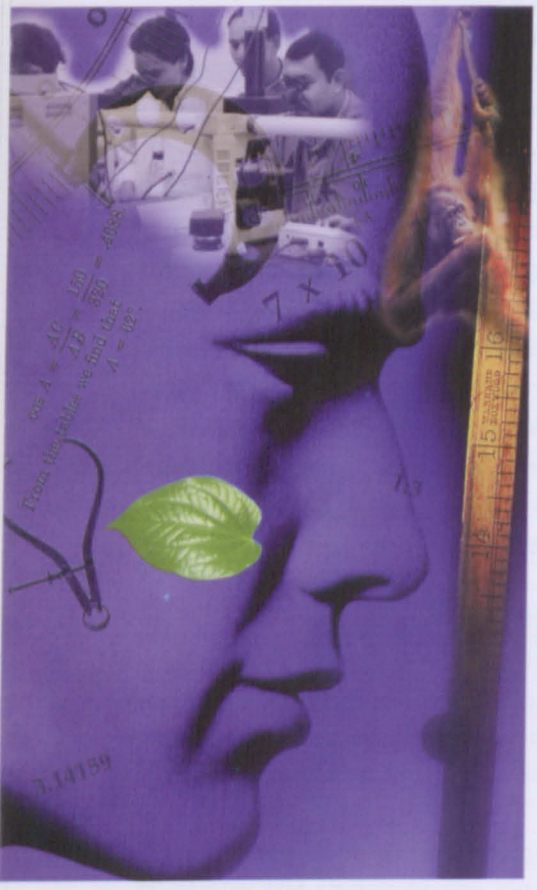
Martin G. Helander and Halimahtun M. Khalid.
Human factors issues in telelearning and CSCW.
The ASAIHL '97, Riverside Majestic Hotel, Kuching, Sarawak, 11-12 August 1997.

This paper summarizes human factors research for design of interactive video systems. The research on telelearning has much in common with Computer Supported Co-operative Work which has its roots in systems for teleconferencing. A systematic framework for human factors issues is described. This explains in a systems context how the major issues are linked. In designing an interactive video scenario, one must consider constraints set by the task, the technology and operator characteristics. The model in the paper lists several tasks, such as learning, probing, meeting, problem solving, information transfer and information sharing. These different tasks are important because they have different goals and the strategies for task accomplishment are also different . Since the new technology will have to rely on new social norms for interacting, the development of a task taxonomy is by no means a trivial question.

Halimahtun Mohd Khalid.
Usability of multimedia in education.
The ASAIHL '97, Riverside Majestic Hotel, Kuching, Sarawak, 11-12 August 1997.

The issue of usability in multimedia is addressed in this paper. Usability, although an established concept in user-centred systems, is relatively unknown in multimedia development. Important usability attributes include: learnability, efficiency, memorability, errors and user satisfaction. Learnability is considered the most fundamental since the first experience most people have with a novel system is learning to use it. Therefore, this paper presents various issues in multimedia production based on an exploratory study of scenario-based simulations of multimedia in education. The demands of producing a multimedia infoware that integrates a variety of media elements in a usable form are discussed. These demands are often underestimated as shown from the study.





THE FACULTY OF RESOURCE SCIENCE & TECHNOLOGY

INTRODUCTION

The Faculty of Resource Science and Technology, established in July 1993, was tasked with developing academic and research programmes pertaining to the science, management and prudent utilisation of natural resources. Equal priorities have been given to teaching and research activities, although in the early stages of its development a great deal of its resources has been devoted to teaching-learning. Nevertheless, the Faculty has managed to establish a strong foundation for research in some selected areas for which considerable expertise and adequate facilities have been developed. The major areas are: ***(i)*** tropical biodiversity, ***(ii)*** environmental studies, ***(iii)*** sago research and ***(iv)*** plant natural products. The choice of these areas reflects the Faculty's commitment to research activities that are most relevant to Sarawak in particular and Borneo in general.

In tropical biodiversity research, the main thrust has been on the establishment of baseline data on the flora and fauna that occur in Sarawak, particularly with respect to the range and distribution of species and their conservation status. A great deal of work has been devoted to inventory and collection of specimens for the Faculty's herbarium and museum which, together, have amassed some 11,200 plant specimens, more than 5,000 insects, 2000 molluscs, 1,000 fishes and some 500 specimens of other vertebrates including mammals, herpetofauna and birds, for use as reference materials in teaching and research.

In environmental research the major emphasis has been on the study of the river systems covering aspects like water quality parameters especially heavy metal and organic pollution, sedimentation profiles, and the impacts of human activities on water catchment areas. The major objective in these studies is to formulate an effective guideline for the management and conservation of of water resources.

Sago research was prompted by the fact that sago starch production is a major industry in the State and focuses mainly on two aspects. The first aspect is the bioconversion of sago waste pith with the aim of reducing its pollution effect and producing value-added products from this cellulosic material. The other area is the generation of DNA-based molecular markers for distinguishing different cultivars of sago for use in future breeding programme.

Research in plant natural products gained its impetus from the discovery by NIH scientists of an anti-HIV compound extracted from Callophylum lenigerum, a plant species found in Sarawak tropical jungles. The main interest of the faculty however is in plants that produce bioactive compounds that have insecticidal properties.

RESEARCH PROGRAMMES

Biodiversity Research

Tropical biodiversity has been identified as a thrust area in the faculty to take advantage of the occurrence of the stretches of tropical rainforests in Sarawak. These rainforests vary in form and structure and harbour a rich diversity of flora and fauna species, much of which has not been studied. As in other parts of the tropics, this natural heritage is subjected to increasing threat from the rapidly growing human population.

Beginning in early 1994, an FRST team led by Assoc Prof Dr Isa Ipor and Assoc Prof Dr Fatimah Abang has embarked on various projects particularly on plant systematics and diversity, wildlife diversity and distribution, insect diversity, marine and fresh water ecosystems. The main goal of these studies is to update existing information on the biodiversity of the state and the nation by gathering baseline data on the abundance and distribution of flora and fauna as well as on the aquatic resources representing the different ecosystem in Sarawak and Borneo.

To attain this goal, several scientific expeditions were organized namely the Bakun (1994); Bario (April 1995), Gunung Silam, Sabah (August 1995) and Samunsam (October 1997) expeditions. In addition, numerous research projects were conducted by individual faculty members and students in Kota Samarahan and Kuching division. Grants from internal Research Fund as well as external sources were obtained to fund these research activities.

The results of these research activities have been disseminated in conferences and seminars, in journal articles, monographs and books. Several new records for Sarawak of flora and fauna species have been reported. This indicated the inadequacy of our current knowledge on biodiversity and signalled the need for more urgent and extensive research on tropical biodiversity before more species become extinct under the might of human activities.

Sarawak Environment Studies

An FRST research team led by Assoc Prof Dr Lau Seng and Dr Zani Assim has been actively conducting studies in this area. Documentation of surface water quality of several rivers and dams, including the Sg. Sarawak, Sg. Maong, Batang Rajang, Batang Ai Dam, Sg. Miri and the river system in the Bario Highland have been conducted. FRST has collaborated with CTTC and the Faculty of Engineering to secure a contract research sponsored by the Department of Environment, Malaysia to conduct a baseline water quality study on Sg. Bakong, Miri. This study has been successfully completed and the findings have been utilized by the Sarawak Northern Water Board (LAKU) to determine a supplementary water supply source for Miri area. Besides monitoring the water quality of natural rivers, our researchers also conducted studies on the characteristics of industrial effluents such as those discharged from paper mills and electronic industries.

Sediment has long been recognized as an important source of environmental data. An FRST research team has conducted studies in collaboration with The Geological Survey Department, Malaysia on the heavy metal profile of the bottom sediment from Sg. Sarawak and Kuching Bay. These studies have revealed that high concentrations of As, Pb and Hg occur at some stretches along Sg. Sarawak Kanan. Such findings could be linked to the gold mining activities at Bau. Subsequently, a study on the bioaccumulation of heavy metals by freshwater molluscs in Sg. Sarawak was conducted. The study showed high levels of heavy metals and the mulluscs were not fit for human consumption. Besides heavy metals, organic constituents in the sediment such as n-alkane, polyaromatic hydrocarbons (PAHs) and pesticide residues have also being analyzed. PAHs analysis in the sediments of Batang Rejang and the coastal waters of Sarawak has enabled the anthropogenic and the natural sources to be distinguished. Such findings are important in assessing the environmental impacts of the various types of land uses. Pesticide residues, particularly the organochlorines are hazardous to aquatic ecosystems. In collaboration with the Agriculture Research Centre, Semongok, our research team is now conducting a study on the fate of pesticides in the Sg. Maong catchment area. This study would shed some light on the extent of pesticide pollution in the area.

Another FRST team has carried out a case study on the impact of urbanization on the water quality of Sg. Maong. This study revealed that the natural stream of Sg. Maong has been seriously polluted and proper environmental strategies need to be introduced to manage the development of the township. The same team was actively involved in the Sg. Sarawak Environmental Control and River Monitoring project in collaboration with KTA Sdn. Bhd. and the Danish Hydraulic Institute, sponsored by the Natural Resources and Environment Board, Sarawak (NREB). In this study, management guidelines and river monitoring programme were proposed.

The Faculty has secured two IRPA grants to conduct the above studies on environmental changes within the Sg. Sarawak catchment area and coastal areas as a consequence of economic development. These studies, it is anticipated, would provide vital environmental data for the formulation of water catchment and coastal zone management strategies for the state of Sarawak.

Sago Research

Sago starch production is an important industry in Sarawak and is set to become even more important as the state embarked on large scale plantations of the crop. Accordingly, the Biotechnology group headed by Assoc Prof Dr Mohd Azib Salleh, initiated research on some aspects of the sago palm. The first aspect was on sago molecular biology. A study has led to the discovery of DNA molecular markers that can be used to differentiate populations of sago taken from different geographical locations, or individual seedlings derived from the same tree. The technique is a quick and powerful tool that can utilized for screening and selection of sago planting materials for large scale sago plantations.

The second major aspect is on the bioconversion and utilisation of sago waste as a raw material for the production of useful by-products. A study done by Dr Kopli Bujang and Dr Kasing Apun had shown that certain strains of bacteria isolated from the local environment can be used to convert the cellulosic waste into valuable by-products. A detailed molecular analysis is being conducted on selected strains with the aim of utilizing them in fermentation technology. International collaboration in this area of research with Kyushu University, Japan was initiated in 1997, with support from the Japanese Society for the Advancement of Science (JSPS). Dr Kopli Bujang was invited to Kyushu University for a month (November 1997) under a JSPS fellowship to carry some research on sago starch fermentation technology.

Another aspect was sago starch chemistry. Encik Fasihuddin Ahmad had been studying the physico-chemical characteristics of sago starch in collaboration with the North East Wales Institute in the UK for his PhD. The ultimate objective is to chemically modify sago starch into new value-added products.

Plant Natural Products

Plants that have medicinal value or produce other bioactive compounds form part of the treasure found in tropical rain forests. A study on such plants was initiated by the faculty's founding Dean, Prof. Laily B. Din and this led to the documentation of their occurrence and local applications. The documentation is essential for follow-up studies to isolate and identify the active compounds. This area of research attracted support from an external funding source. The TORAY Foundation awarded a grant worth nearly RM50,000 to a group led by Dr. Muney Serit in 1994 to carry out studies on bioactive compounds derived from Piper sp. (Piperaceae). The study led to the formulation of simple bioassay techniques for detecting and screening insecticidal compounds from local plants.

Research on pepper stalks (a waste product from the pepper industry) as a source of bioactive compounds was also carried out with funding from the Pepper Marketing Board of Sarawak. A preliminary analysis of the chemical composition of pepper stalks showed the presence of a considerable amount of alkaloids (particularly piperine) and essential oils. Further investigations will focus on bioassay guided isolation of bioactive compounds from this waste product and structure modification of isolated compounds.

A. PUBLICATIONS

Tuen A.A. and J.S. Brown.
Evaluating habitat suitability for tree squirrels in a suburban environment.
Malaysian Applied Biology 25(2): 1-8 1996.

Measuring an animal's use of food patches can reveal its perceptions of safety, food availability, and its own well-being in both disturbed and pristine habitats. In this paper we use foraging theory and patch-use technique to evaluate the response of tree squirrels *(Sciurus niger)* to patch richness, food quality and predation risk in a disturbed habitat in suburban Chicago. Giving up densities (GUDs) were measured in food patches containing 9, 18 and 27 g of sunflower seeds to evaluate response to patch richness. Response to food quality was studied by measuring GUDs in patches containing seeds which had been treated with oxalate and tannins. Predation risk was varied by placing the food patch at the base and three meters away from the base of a tree. Tree squirrels responded to food abundance by biasing their foraging activity towards rich patches and equalized GUDs among food patches. Oxalate significantly reduced the value of the food resulting in higher GUDs compared to tannins. Microhabitat differences in GUDs indicated that foraging away from a tree posed a higher predation risk to squirrels than foraging near a tree. We conclude that appropriate and careful measurements of GUDs can reveal an animal's perception of habitat quality, food characteristics and predation risk.

Abdullah M.T.
Some aspect of wildlife utilization in Sarawak.
The Sarawak Museum Journal, 71: 201-207 1996.

Wildlife use is culturally and traditionally important among the communities in Borneo. In order to understand the current status of wildlife in Borneo, brief observations were conducted in 1995 to investigate the occurrence of wildlife utilisation in local markets in Sarawak. The wildlife involved in the trade were frogs, soft-shelled turtles, snakes, lizards, birds, monkeys, barking deer, mouse deer, sambar deer and wildpigs.

Abang F., Sulaiman Hanapi & Muney Serit.
Systematic Entomology in Sarawak: A Preview.
Serangga 1(2):63-73 1996.

The insects overwhelming numbers have been considered to be the greatest problem in estimating regional biodiversity. However, this, together with identification problem should not be used as criteria to ignore systematics studies of this group. Systematics provides a framework for understanding biodiversity and for organizing the variety of organisms to assist cooperative work and stimulates ideas in numerous disciplines. This paper discusses past work related to systematics in Sarawak. The percentage of coverage of Sarawak insects that have been documented is presented.

Serit, M.; Fatimah, B.A.; Fasihuddin, B.A.; Hanapi, S.; Bojo, B.O.; Din, L.B & Ghazally, B.I.
Antitermite properties of two plant extracts from East Malaysia.
Bulletin Kimia, Jld. 11, bil. 1 & 2, 13-17. 1996.

Fifteen plant extracts were evaluated for antitermite activity using a newly established, quantitative no-choice feeding assay. In laboratory conditions, pseudogates of termite *Schedorhinotermes sarawakensis* Holmgren that were reared in the absence of food could only survive for a maximum of 9 days; while those that were fed with paper discs showed good survival rate (98%). Two of the plants showing potent antitermite activity were *Piper* sp. *(Piperaceae)* that caused 100% mortality within 6 days at 1.67% w/w concentration and *Goniothalamus* sp. *(Annonaceae)* that reduced termite survival rate to 2.7% on day 12 at 3.33% w/w concentration.

Lau Seng, Zani Assim, Murtedza Mohamed and Laily B. Din
The River System and Water Quality of Bario Catchment.
In A Scientific Journey Through Borneo : Bario - *The Kelabit Highland, Ghazally Ismail & Laily Din, eds.,Pelanduk Publications, Petaling Jaya. Malaysia, 21-28, 1998,*

The river systems that drain the Bario Plateau were studied. A field survey conducted together with the guides from Bario revealed the river system, and the major tributaries in the catchment were identified. Water quality of the rivers and streams within five kilometer radius around Bario Asal was studied. The pH of the water in this region was found

to be unexpectedly low at about 4.8 to 5.2 . The amount of suspended solids in the water was relatively low averaging about 100 mg/L. Rivers draining the settlement areas around Bario Asal were found to be clean with high DO, low suspended solids, low dissolved solids and low in phosphate, nitrate, and ammoniacal nitrogen. Rivers over the eastern side of Bario, such as Pa' Ukat, Pa' Umor and Sg. Dappur have higher loads of suspended solids and its colour ranged from 44 to 66 Pt/Co unit. Most soil erosion that occured in this part is suspected to be due to deforestation for agricultural activities (rice and pineapple farming). Pollution from agrochemical and fertilizer was insignificant.

I.B. Ipor, C.S. Tawan, J. Ismail, O. Bojo.
Floristic composition and structures of forest at Bario Highlands, Sarawak.
In A Scientific Journey Through Borneo : Bario - The Kelabit Highland, Ghazally Ismail & Laily Din, eds, Pelanduk Publications, Petaling Jaya Malaysia, 113 - 131, 1998

Four localities, viz. Bario Asal, Pa'Ukat, Aur Bilak Ligan and Batu Lawi were surveyed using a 20m x 20m plots. The floristic composition and structures of the forest in this plots were determined. The types of forest associations established from the survey included *Cratoxylum formosum-Eugenia rugosa* association for Bario Asal, *Gymnostoma nobile-Calophyllum griseum* association for Pa' Ukat, *Agathis ligan* and *Agathis borneensis-Payena maingayi* association for Batu Lawi. The number and species diversity of trees surveyed revealed that the degree of stratification and tree size varied between localities. The biomass of these forests ranged between 74.24 t/ha to 2225.49 t/ha. The total above ground biomass value for Batu Lawi (1650m a.s.l.) was comparatively high compared to Bario Asal. The high value of biomass at this particular location was mainly contributed by mature *Agathis borneensis* trees.

Salleh, M.A., E.S.U. Hang, A.R. Mustafa & M.T. Abdullah.
Isolation of Genomic DNA from Fruits Bats of Kelabit Highlands for DNA Archiving and Determination of Genetic Variation.
In a Scientific Journey Through Borneo: Bario - The Kelabit Highland, Ghazally Ismail & Laily Din, eds., Pelanduk Publications, Petaling Jaya. Malaysia, 231 - 240, 1998

A total of 40 fruits bats belonging to five species, namely *Cynopterus brachyotis* (34), *Aethalops alecto* (3), *Pipistallus tenius* (1), *Balionycteris maculata* (1) and *Megaerop ecaudatus* (1) were captured from two sites during the expedition to Bario in April 1995. Whole blood and liver tissue samples were taken from freshly killed bats and stored in liquid nitrogen in the field before transferring to a -70°C deep freezer in the laboratory. Genomic DNA was successfully isolated from whole blood samples derived from 13 bats using SDS-lysis followed by phenol-extraction methods. Pure DNA samples were dissolved in tris-EDTA buffer and stored at -20°C for DNA archiving and determination of genetic variations within and between the different species.

Rajah, S.B.R.
Aliphatic Hydrocarbons in Surface Sediments from the Sarawak River Subestuary.
International Conference on Environmental Chemistry and Geochemistry in the Tropics; K.Lumpur; April 7-11, 1997.

The distribution, nature and origins of aliphatic hydrocarbons in superficial sediments from the Sarawak river were investigated. In addition to n-alkane concentration, several other specific parameters such as carbon preference indices (CPI), pristane to n-heptadecane, phytane to n-octadecane ratios and others were also determined to assess and track the aliphatic hydrocarbon signature in bottom sediment. Sediment samples were collected along the Sarawak river from the mouth to Kuching city (downstream). Aliphatic hydrocarbon patterns showed that the upstream (urbanised) area had the highest hydrocarbon concentration. However, the concentration was comparatively low at the mouth of the river due to flushing by tides and currents. Aliphatic hydrocarbon assemblages observed in the sediment samples were relatively rich in hydrocarbons of pyrolytic and biogenic origin. However, the presence of petrogenic hydrocarbons was also indicated by other parameters in several samples. These observations suggest that the

municipal and industrial discharges constitute the major source of organic input into the Sarawak river system.

Jamel B., M. Morshidi and M. A. Salleh
Identification of Molecular Markers for Sago Palm *(Metroxylon sagu)* Using a Polymerase Chain Reaction Technique.
In Positioning National R&D in Biotechnology for Global Competitiveness. Proc 9th National Biotech Seminar, 23-26 Nov 1997, Penang. Z. Zamrood & K.L. Wan (eds.) 194-197

Randomly amplified polymorphic DNA-Polymerase chain reaction (RAPD-PCR) technique was used to identify potential molecular markers for distinguishing different lines of the sago palm, *Metroxylon sagu*,. Primers from a commercially available kit and a 16mer primer based on minisatelite DNA sequence were used to amplify fragments of sago genomic DNA isolated from young leaves using the cetyltrimethlarnmonium bromide (CTAB) method. The number of fragments amplified by each primers varies depending on the primer and template genomic DNA used. Two primers from the commercial kit and the minisatelite primer were found to produce polymorphisms in PCR products which could distinguish seedlings derived from four different geographical locations or between those that possess different morphological traits.

Jong. B. C., Apun, K. and Salleh, M. A.
Detection of Fermentation Products from Sago Waste Residue by High Performance Liquid Chromatography .
Proc 3rd International Symposium on Trends in Biotechnology; 15-17 May 1996, Serdang, Selangor. pp. 189-191

Sago waste residue or hampas was evaluated for its suitability as a substrate for sugar, acid and alcohol production using a locally isolated cellulolytic and amylolytic Bacillus strain, UMAS1002. Batch fermentation study was performed in a shake-flask system for 72 hours. HPLC was used to detect and identify the major fermentation products. It was shown that glucose, maltose, acetic acid, lactic acid, ethanol and glycerol were among the products detected during the fermentation. The detection of these compounds suggested that the Bacillus strain, UMAS1002 has potential in the production of value-added products from sago waste.

Jamel, B. & M.A.Salleh.
Isolation of genomic DNA from *Metroxylon sagu*
6th International Sago Symposium; Riau, Indonesia. 9-12 Dec 1996

Isolation and analysis of genomic DNA is an essential step towards genetic manipulation of sago for yield improvement,- shortening of maturity period and biosynthetic pathway intervention to produce modified/novel starches. A simple protocol using SDS (Sodium Dodecyl Sulphate) as the cell lysing agent has been found to be effective. In this method, 1 gm of young sago leaves was ground in liquid nitrogen before adding a lysis solution containing SDS. The lysis mixture was then warmed at 65'C for 15 min. and protein precipitation in ice with 5 M Potassium acetate. Following removal of cell debris by centrifugation, the DNA in the supematant was precipitated in isopropanol at -200C, washed twice in 70% ethanol, and then redissolved in Tris EDTA buffer for analysis using gel electrophoresis.. Chloroform: isoamyl extraction and isopropanol precipitation could be done for further purification of the genomic DNA for restriction enzyme analysis.

B. CONFERENCE AND SEMINAR PRESENTATIONS

Hambadeley H. and A.A. Tuen.
Nutritional ecology of short-nose fruit bat, Cynopterus brachyotis. In Harmonising Livestock Production with the Environment.
Proc. 19th Ann. Conf. Malaysian Society of Animal Production, Johore Bahru, 8-10 September 1997. P. 143-144

Fruit bats play an important role in forest ecology and rural economy through pollination, seed dispersal, through the damage they cause to fruits as well as being themselves consumed as food item by humans. In order to assess the potential fruit damage caused by these bats we studied the preference, intake and excretion of local fruits by Short-nose fruit bat, *Cynopterus brachyotis* in captivity. Fruit preference was investigated by hanging bananas, papaya, guava, rambutans and star fruits of known weight from a tree placed inside a room containing 30 bats. The fruits were offered in the afternoon and the weight remaining at 6, 8 and 10 pm and the following morning were recorded for seven consecutive days. The result showed that bananas of varieties Pisang Mas and Pisang Mas Keling were highly preferred by bats while bananas of variety Pisang Nipah, guava, rambutans and star fruits were least preferred. The faster consumption rate of the preferred fruit was due to greater number of bats feeding on it and not due to greater intake by an individual bat. This hypothesis was tested in the second trial using 18 male bats which were randomly allocated to feed on banana (var. Pisang Mas), guava or papaya. In this trial the bats were placed individually inside a cage and its food intake and excretion measured for 21 days. The mean dry matter intake were 5.8, 5.4 and 6.2 g dry matter per day for banana, guava and papaya, respectively. Significantly less ($p<0.001$) guava was digested compared to either banana or papaya. This low digestibility was probably due to the high fibre content or the presence of secondary compounds in the guava. This aspect is currently being investigated.

Sani, H.B. & Dayang Awa.
The Use of Epicormic Shoots for Vegetative Propagation of Belian (*Eusideroxylon Zwageri* T & B). ***International Symposium on Conservation Biology: Molecular, biotechnological and conventional approaches; Kuching, Sarawak, 19 - 23 November 1995.***

Belian (*Eusideroxylon zwageri*), also known as Iron wood of Borneo is a protected species of Sarawak, and only special license is issued to extract it. Although gazetted as protected species, the area where belian is found has been drastically reduced. The natural regeneration of belian is usually hampered by the irregular flowering and poor fruit formation. Moreover, it takes 6 to 12 months for the belian seeds to germinate. At the same time the rooting capacity of the shoots declined with the age of the mother plant. An experiment was carried out to look into vegetative propagation by rooting cuttings using epicormic shoots as an alternative solution to seedling supply. The results show that rejuvenated epicormic shoots can be rooted with the help of rooting hormone (rooting percentage ranges form 8 to 45%) compared to cuttings taken from 3-year old seedlings (75%).

Lee Nyanti, Tan Soon Peng & Chin Phui Kong.
An Ichthyological Survey of the Upper Batang Rajang, Sarawak, Malaysia.
International Symposium on Conservation Biology: Molecular, biotechnological and conventional approaches; Kuching, Sarawak, 19 - 23 November 1995.

The Rajang River is the main drainage system for central Sarawak. It is also the longest river in Sarawak having its original from the Nieuwenhuis Mountain Range and the upper Kapuas Mountains and flows to the South China Sea. Sampling of fish fauna at Batang Balui, Sungai Murum, sungai Linau, Sungai Bahau and their tributaries was carried out in July, August, November and December 1994. A total of 21 sampling stations in the main rivers and 29 sampling stations in their tributarties were selected. Sampling of fish fauna from the main river was carried out using gill nets and cast nets of different mesh sizes. Fish from the tributaries were sampled using electrofishing device powered by a 500 watt portable generator and cast net. A total of 15 families represented by 41 genera and 104 species were caught. *Cyprinidae* accounted for 54 percent of the total number of species caught while *Balitoridae* accounted for 12 percent and

Bagridae 9 percent. In terms of the number of the individual, approximately 66 percent are represented by the *Cyrinidae*, 13 percent by the family *Balitoridae* and 10 percent by the family *Cobitidae*. Species that are adapted to clear and fast flowing water and stays on rock surfaces such as *Akysidae, Bagridae, Balitoridae, Channidae, Claridae* and *Cobitidae* are only found in the tributaries. The family *Cyprinidae* is found both in the tributaries and the main river.

Lau Seng, Murtedza Mohamed, Adrian Tan Chi Yen and Sabtuyah Su'ut.
Accumulation of Heavy Metals in Freshwater Molluscs.
International Seminar on Trace Metal in the Aquatic Environment; Kuala Lumpur; 19 - 23 May, 1997

Heavy metals in the aquatic environment have so far been largely been shown to originate from naturally occurring geochemical materials. However, this occurrence has been enhanced by human activity such as gold mining in the case of heavy metal pollution in Sg Sarawak Kanan. The high suspended solid loads in the river have quite efficiently removed most soluble metals from the water and trapped them in the bottom sediment. Three freshwater mollusc species were collected at the point source of the heavy metal pollutants and analysed for the heavy metal contents in their tissues and shells. Two of the mollusc species (*Brotia costula* and *Melanoides tuberculata*) are purely freshwater species while the *Clithon* sp. nr retropictus is able to survive in fresh and brackish water environments. The *Brotia costula* and the *Clithon* sp. are edible species which are sold in the market. Accumulation of As, Cu, Fe, Se and Zn in all the three mollusc species were detected and the level of As in the tissues of *Brotia costula* and the *Clithon* sp. was much higher than the permissible level for human consumption. The mollusc species also demonstrated different preferences for the uptake of different metal. Variations in the heavy metal contents in the shell and tissues of the same species were also observed.

Lau Seng and Evelyn Chung Hui Hui.
Adsorption of Metals by Suspended Solids in Acidic Environment.
Malaysian Chemical Congress '97; Johor Bahru; 18 - 20 November, 1997

Sarawak has vast areas of peat swamps and several of its rivers, particularly at the lower reaches where they drain through the peat areas, showed pH levels between 4 and 5. At this acidic condition one would wonder whether heavy metals will be leached into the water ways. Suspended solids in rivers are capable of removing soluble metals through adsorption, particularly on clay particles. This work was designed to study the metal adsorption capability of suspended solids of various grain sizes (sand > 63(m, silt >38 (m, and clay < 38 (m) in a peaty water environment. Three metals were selected for this study, namely Cu, Fe and Zn. The condition of the experiment were set to a pH of 4 and at temperature 25 C. The influence of humic materials which are abundant in peaty water was not included in this study. It was found that suspended solids from all the three categories of grain sizes were able to adsorb Cu, Fe and Zn at different capacities. The adsorption capacity was found to be inversely proportional to their grain size and the affinity for the different metals varied. The adsorption coefficients for Fe was higher than Cu and higher than Zn for all the suspended solids types. This study showed that suspended solids are capable of removing heavy metals from a water body even at low pH condition.

C. FULL LIST OF PUBLICATIONS

Tuen. A.A. 1994. Effect of partially replacing commercial concentrate with sago pith meal on dry matter intake and digestion by goats. *Malaysian Applied Biology* 22(2): 137-142

Tuen A.A. and J.S. Brown. 1996. Evaluating habitat suitability for tree squirrels in a suburban environment. *Malaysian Applied Biology* 25(2):1-8

Abang. F, Hanapi, S. & Muney Serit. 1996. Systematic Entomology in Sarawak : A Preview. *Serangga* 1(2): 63-73

Jiwan and A.A. Tuen. 1995. Feeding behaviour and quality of feed offered to sambar deer (Cervus unicolor) under semi-natural environment. In Towards Corporatising the Animal and Feed Industries, *Proc. 17th Ann. Conf. Malaysian Society of Animal Production, Penang. 70-74*

Tuen, A.A. D. Jiwan and F. Gombek. 1996. Development of indigenous animal species for food and ecotourism - a Sarawak experience. In *New Perspectives in Animal Production. Silver Jubilee Malaysian Society of Animal Production Conference*, Kuching. 136-144

Helwana Hambadley and A.A. Tuen. 1997. Nutritional ecology of short-nose fruit bat (Cynopterus brachyotis). In Harmonising Livestock Production With The Environment, *Proc. 19 Ann. Conf. Malaysian Society of Animal Production,* Johore Bahru. 143-144

Hamsawi, S; Dayang Awa, A.L. and Siti Rubiah, Z. 1995.Growth and Biomass Allocation of Eusideroxylon zwageri T&B Seedlings to Different Light Regimes. *In* Ipor et al (eds) *Malaysian Natural Resources*, 85-92.
Hamsawi, S. and Dayang Awa, A.L. 1995. A Preliminary Study on the Potential of Eusideroxylon zwageri T & B to Form Epicormic Shoots. *In* Ipor et. al (eds) *Malaysian Natural Resources*, 93-98.

Salleh, M.A., U.H. Sim, A.R. Mustaffa & M.T. Abdullah (1998). Isolation of Genomic DNA from fruit bats for DNA archiving and determination of genetic variation. In *A Scientific Journey Through Borneo: Bario, The Kelabit Highlands*. Eds Ghazally et al., Pelanduk Publications, Kuala Lumpur 231-240.

Ipor, C.S. Tawan, J. Ismail and D. Bojo (1998). Floristic Compositions and Structures of Forest at Bario Highlands, Sarawak. In *A Scientific Journey Through Borneo : Bario, The Kelabit Highlands of Sarawak*. Eds Ghazally et al. Pelanduk Publication, K. Lumpur.. *113-132*

Ismail, I.B. Ipor and C.S. Tawan (1998). Specific Gravity of Agathis Borneensis Warb. of the Kelabit Highlands. In *A Scientific Journey Through Borneo : Bario, The Kelabit Highlands of Sarawak* Eds. Ghazally et al. Pelanduk Publication, K. Lumpur. *133-140*

Laily b. Din, Ghazally Ismail and John A. Elix (1998). The Lichens in Bario Highlands: Their Natural Occurrence and Secondary Metabolites. In *A Scientific Journey Through Borneo : Bario, The Kelabit Highlands of Sarawak*. Eds Ghazally et al. Pelanduk Publication, K. Lumpur. *155-160*

Fatimah Hj. Abang and Sulaiman Hanapi (1998). An Account of Caddisflies (Trichoptera) From Bario, Kelabih Highlands, Sarawak. In *A Scientific Journey Through Borneo : Bario, The Kelabit Highlands of Sarawak*. Eds Ghazally et al. Pelanduk Publication, K. Lumpur. *179-182*

Lee Nyanti, Ling Teck Yee and Khairul Adha (1998). Freshwater Fishes from Bario, Kelabit Highlands, Sarawak. In *A Scientific Journey Through Borneo : Bario, The Kelabit Highlands of Sarawak*. Eds. Ghazally et al. Pelanduk Publication, K. Lumpur. *183-192*

Shabdin Mohd. Long and Fatimah Hj. Abang (1998). The Benthic Invertebrate Community of Rivers in Bario, Kelabit Highlands, Sarawak. In *A Scientific Journey Through Borneo : Bario, The Kelabit Highlands of Sarawak*. Eds Ghazally et al. Pelanduk Publication, K. Lumpur. *193-200*

Ramlah Zainuddin (1998). A Brief Note on Frogs of Bario, Kelabit Highlands, Sarawak. In *A Scientific Journey Through Borneo : Bario, The Kelabit Highlands of Sarawak"*. Eds. Ghazally et al. Pelanduk Publication, K. Lumpur. *201-206*

Mustafa Abdul Rahman, Mohd Tajuddin Abdullah and Besar Ketol (1998). The Small Mammals of Bario, Sarawak. In *A Scientific Journey Through Borneo : Bario, The Kelabit Highlands of Sarawak*. Eds. Ghazally et al. Pelanduk Publication, K. Lumpur. *215-220*

Mohd Tajuddin Abdullah, Maklarin Lakim and Mustafa Abdul Rahman (1998). Notes on Large Mammals of Bario, Sarawak. In *A Scientific Journey Through Borneo : Bario, The Kelabit Highlands of Sarawak*. Eds. Ghazally et al. Pelanduk Publication, K. Lumpur. *221-222*

Andrew Alex Tuen, Mustafa Abdul Rahman and Mohd Tajuddin Abdullah (1998). Age Classification of Bearded Pigs (Sus Barbatus) from Bario, Kelabit Highlands. In *A Scientific Journey Through Borneo : Bario, The Kelabit Highlands of Sarawak*. Eds. Ghazally et al. Pelanduk Publication, K. Lumpur.. *223-230*

Chan, C.L., A. Ueda and F. Abang. 1996. Beetles. In K.M. Wong & A. Phillips (ed.) *Kinabalu Summit of Borneo (2nd ed)*. The Sabah Society in association with Sabah Parks, Kota Kinabalu, Sabah, Malaysia. 315-331

Abang. F, Abd. Hamid Ahmad, Nordin Wahid & Chong Kian Seng. 1995. A preliminary survey of butterflies of the Tawau Hills Park, Sabah. In Ghazally Ismail, Siraj Omar & Laily B. Din (eds.) 1995. *A Scientific Journey Through Borneo: Tawau Hills Park, Sabah*. Pelanduk Publication (M) Sdn. Bhd. Kuala Lumpur. 191-196

Tawan, C. 1998. Gynotroches Blume. In : Sosef, M.S.M., Hong, T.L. & Prawirohatmodjo, S. (Editors) : *Plant Resourses of South-East Asia No 5(3). Timber trees : Lesser-known timbers*. Backhuys Publisher, Leiden. 276-277.

Tawan, 1998. Pteleocarpa Oliv. In : Sosef, M.S.M., Hong, T.L. & Prawirohatmodjo, S. (Editors) : *Plant Resourses of South-East Asia No 5(3). Timber trees : Lesser-known timbers*. Backhuys Publisher, Leiden. 477-478.

Doungsa-ard, C. & Tawan, C. 1997. Mimosa diplotricha C.Wright ex Sauvalle. 1997. In Faridah Hanum, I. & van der Maesen, L.G. (Editors) : *Plant Resourses of South East Asia No 11. Auxillary plants*. Backhuys publisher, Leiden, the Netherlands. 197-199.

Ipor, I.B. 1998. Scolopia Schreb. In : Sosef, M.S.M., Hong, T.L. & Prawirohatmodjo, S. (Editors) : *Plant Resourses of South-East Asia No 5(3). Timber trees : Lesser-known timbers*. Backhuys Publisher, Leiden. 513-514.

Ipor, I.B. 1998. Norrisia Gardner. In : Sosef, M.S.M., Hong, T.L. & Prawirohatmodjo, S. (Editors) : *Plant Resourses of South-East Asia No 5(3). Timber trees : Lesser-known timbers.* Backhuys Publisher, Leiden. . 408-409.

Ipor, I.B. 1998. Metadina Bakh.f. In : Sosef, M.S.M., Hong, T.L. & Prawirohatmodjo, S. (Editors) : *Plant Resourses of South-East Asia No 5(3). Timber trees : Lesser-known timbers.* Backhuys Publisher, Leiden. 373-374.

Ipor, I.B. 1998. Koilodepas Hassk. In : Sosef, M.S.M., Hong, T.L. & Prawirohatmodjo, S. (Editors) : *Plant Resourses of South-East Asia No 5(3). Timber trees : Lesser-known timbers.* Backhuys Publisher, Leiden. 320-321.

Ipor, I.B. 1998. Erythroxylum P. Brown. In : Sosef, M.S.M., Hong, T.L. & Prawirohatmodjo, S. (Editors) : *Plant Resourses of South-East Asia No 5(3). Timber trees : Lesser-known timbers.* Backhuys Publisher, Leiden. 223-224.

Ipor, I.b. 1998. Brownlowia Roxb. In : Sosef, M.S.M., Hong, T.L. & Prawirohatmodjo, S. (Editors) : *Plant Resourses of South-East Asia No 5(3). Timber trees : Lesser-known timbers.* Backhuys Publisher, Leiden. 120-122.

Ipor, I.B. & Sutarno, H. 1997. Mikania Willd. In Faridah Hanum, I. & van der Maesen, L.G. (Editors) : *Plant Resourses of South East Asia No 11. Auxillary plants.* Backhuys publisher, Leiden, the Netherlands. 194 -196.

Ipor, I.B. 1997. Leucaena leucocephala (Lamk) de Wit. In Faridah Hanum, I. & van der Maesen, L.G. (Editors) : *Plant Resourses of South East Asia No 11. Auxillary plants.* Backhuys publisher, Leiden, the Netherlands. 173-175.

Ipor, I.B. Oyen, L.P.A. 1997. Sesbania Adanson. In Faridah Hanum, I. & van der Maesen, L.G. (Editors) : *Plant Resourses of South East Asia No 11. Auxillary plants.* Backhuys publisher, Leiden, the Netherlands. 236-240.

Ipor, I.B. 1997. Sesbania rostrata Bremek. & Oberm. In Faridah Hanum, I. & van der Maesen, L.G. (Editors) :*Plant Resources of South East Asia No 11. Auxillary Plants.* Backhuys publisher, Leiden, the Netherlands. 240-242.
Bujang K.B. 1994. Composting Industrial Biosolids. *Biocycle*. 35 (10) : 27.

Harwant Singh (1998). The Physiography and General Geology of the Kelabit Highlands Surrounding the Bario Area. In *A Scientific Journey Through Borneo : Bario, The Kelabit Highlands of Sarawak*. Eds. Ghazally *et* al. Pelanduk. Publication, K. Lumpur. *1-20*

Lau Seng, Zani b. Assim, Murtedza Mohamed and Laily b. Din (1998). The River System and Water Quality in the Bario Highlands, Sarawak. In *A Scientific Journey Through Borneo : Bario, The Kelabit Highlands of Sarawak*. Eds. Ghazally et al. Pelanduk Publication, K. Lumpur. *21-28*

Bala a/k Jamel, M. Morshidi & M.A.Salleh. 1997. Identification of molecular markers for sago palm (Metroxylon sagu) using a polymerase chain reaction technique. In *Positioning National R&D in Biotechnology for Global Competitiveness*. Z. Zamrood & K.L. Wan (eds.). *Proc 9th National Biotech Seminar, 23-26 Nov 1997, Penang*. 194-197

Jong, B.C, Apun, K & M.A. Salleh (1996). Detection of fermentation products from sago waste residue by high performance liquid chromatography. *Proc 3rd International Symposium on Trends in Biotechnology;* 15-17 May 1996, Serdang, Selangor. 189-191

Kasing, A., and Lau, S. 1995, Enhancement of Cellulolytic Activity by Immobilised Yeast Cells, *Proc. Tropical Natural Resources Symposium, Kuching, 6-8 Dec.*, 1993, 117 - 124.

Fashihuddin, B.A.; Ipor, I.B and Din, L.B. 1995. Medicinal Plants used by the Kelabit Community in Bario, Sarawak. In *Chemical Prospecting in the Malaysian Forest* (Ghazally Ismail, Murtedza Mohamed & Laily B. Din, eds.). Pelanduk Publ. 43-46

Ipor, I.B.; Fasihuddin B.A.; Din, L.B & Ismail, G. 1995. Lichen Acids of Cladonia siamea des Abb. In *Chemical Prospecting in the Malaysian Forest* (Ghazally Ismail, Murtedza Mohamed & Laily B. Din, eds.). Pelanduk Publ. 87-92.

Lau, S., Ramli, I., Teoh, S. L. and Yap, S. F., 1995, Utilization of Lignin in the Synthesis of Polyurethane Foams, *Proc. Tropical Natural Resources Symposium*, Kuching, 6-8 Dec., 1993, 141 - 147.

Serit, M., F. Abang, F. Ahmad, S. Hanapi, B. Othman, L.DIn & G. Ismail. 1996. Antitermite properties of two plant extracts from East Malaysia. *Buletin Kimia* Jld. II, 1-2. 13-17

Malaysian Natural Resources: Sustainability, Development and Strategies; *Editors*: Isa Ipor, Zani Assim, Fasihuddin Ahmad, Fariddudin Yusof & Laily Bin Din (1995)

Scientific Journey Through Borneo: Sayap-Kinabalu Park Sabah; *Editors*: Ghazally Ismail & Laily Bin Din (1996)

Scientific Journey Through Borneo: Tawau Hills Park Sabah; *Editors*: Ghazally Ismail, Siraj Omar & Laily Bin Din (1996)

Scientific Journey Through Borneo: Bario, The Kelabit Highlands of Sarawak; *Editors*: Ghazally Ismail & Laily Bin Din (1998)

Chemical Prospecting in the Malaysian Forests; *Editors*: Ghazally Ismail, Murtedza Mohamed & Laily Bin Din (1996).

THE FACULTY OF SOCIAL SCIENCES

INTRODUCTION

In the first two years of its formation the Faculty of Social Sciences had to devote its resources on implementing its six undergraduate programmes and on human resource development. The regional shortage of academics was a formidable problem for the faculty whose challenge then was to attract academics to an unknown university and to a place which in many respects, is outside of the traditional university corridor of Malaysia. As a result, for the first two years the faculty was severely understaffed. Thus during the first two years the emphasis had been on the more immediate demand of undergraduate teaching and curriculum development.

In line with the underlying strategic approach of the university to focus its research on areas in which it has the best advantage over other research centres, the faculty had since its inception, established what it considered to be its niche areas. The faculty's conception of its niches areas have been influenced by its geographic location on the island of Borneo, its teaching programmes, current development in the Social Sciences, and existing expertise among the academics.

Borneo had attracted researchers, both in the natural and social sciences since the early years of European colonialism. Indeed the research tradition of the Sarawak Museum, built over the years, had been a very important factor in attracting international researchers to Sarawak. Being the only social science faculty in Sarawak and one of a few on the island of Borneo, the faculty is well placed to assume leadership in area-based social science research.

Within the context of its Borneo research the faculty is also in an enviable position to address current research interests in the social sciences. Taking its teaching programmes and the expertise of its academics into consideration, its issue-based areas of interests are also exploiting the unique features of Borneo society as object of study. Much of Borneo are societies in various stages of transformation from the traditional state.

RESEARCH PROGRAMMES

Resource Tenure

The current importance of resource tenure in the social science is a corollary of the development in the environmental science. The issue of promoting a sustainable management of the natural resources requires an understanding of the relationship between social groups and their relationship with the natural resources.

In Malaysia, and particularly in Sarawak and Sabah, ownership, access and rights over natural resources such as land, trees, rivers, caves, games and more recently water are contentious issues. Contention over and the manner in which these resources were used until recently were governed by traditional custom - the adat. Increasingly this traditional tenure is rendered obsolete and unbinding as traditional communities are being absorbed into the main stream economic system. The nature of the contest for the access to and control of the natural resource have also changed - powerful commercial interest and the government are staking their claim, and new and conflicting uses of the resources are emerging.

This research programme focuses on resource tenure issues which impinge on the sustainable livelihood of rural communities in Sarawak. Its thrusts are to unravel the nature of traditional or existing resource tenure in these communities and understand the implications of such system on the sustainability of the community concerned. The second thrust of the programme is the Political Ecology of resource tenure - an attempt at understanding the emerging contest for resources within the framework of local and state politics. The third thrust is a critical assessment of emerging forms of resource tenure. These new forms are both formal and planned and informal and spontaneous - consequences of government policies and adaptation of various social groups and economic interests.

Up to date a project on agricultural sustainability on the Bario Highlands had been completed. This project highlights the natural resource viability of wet rice cultivation in Bario and points out a possible source of weakness which the system might face as a result of the demographic transformation of the Kelabit community. The project also identified species of wild vegetables which are commonly consumed on the highland, contributing to the strong reliance of the community on the surrounding forest.

Community Development

The Community Development research programme is a study of grass-root development. Although in Malaysia most of the initiative, energy, and resources for development come from the government, there are instances of local communities taking the initiatives and participating in their own development. Of interest to the programme also is the reverse situation - the failure of government initiated development projects to galvanise local participation or acceptance of the changes proposed.

Sarawak offers a wealth of fieldwork opportunities in this area of research. One of the most vexing issues in community development in Sarawak today is land development - a policy to promote local participation in plantation agriculture. There is widespread resistance to this form of agricultural development and an understanding of the nature of this resistance is critical for policy making and a better understanding of grass-root participation.

There are many efforts at promoting local initiative as an element of development project. For example the promotion of rural cooperatives is part of an effort to improve rural income and so is the creation

of village Development and Security Committee, a leadership structure for local development. Two projects under this programme are in their advance stage.

The first project is on rural cooperative society, this study focuses on the failure of this form of local effort to sustain itself. The project raises the question of whether it is a relevant institution in prevailing socio-economic environment.

The second project under this programme is a participatory action research approach in the study of women's community health development programmes in selected village communities in the Kuching Division. This study looks at the effective strategies in implementing community participatory projects that is aimed towards health development among rural women. There are two levels to the study.

The first level involves preparing health care personnel(nurses, medical assistants, public health assistants, and health inspectors) to participate in the project as change agents. A workshop was held to impart knowledge about the participatory action research (PAR) approach as well as skills in conducting training workshops based on the PAR approach for use in starting women's health development projects.

The second level of this project involves applying the PAR method at the community level. At this stage the objective is to understand how the participatory action research method can be deployed in mobilising women in developing their own health development project to address a health priority, which is determined by the community themselves.

A number of insights was gained from the first half of this project. The training workshop to train health care personnel as change agents is the first step towards moving away from the traditional paternalistic model of development and towards a working understanding of the community participatory approach. It is not sufficient to impart knowledge of community participation and the participatory action research(PAR) principles during the training of health care personnel as change agents. It is also essential to provide enabling skills for change agents to carry out such PAR training and methods at the community level.

It is envisaged that this research programme would also cover studies of successful partnership between the local communities and the government or the private sector in commercial agriculture and the appraisal of the various government self-help schemes.

Minority Groups and Ethnicity

Borneo is known for its ethnic diversity, making it an obvious research priority. Although basic ethnographic research in Borneo have covered all distinct ethnic groups, many aspects of ethnicity are yet to be researched. One aspect of Borneo ethnicity which needs to be studied urgently is ethnic/race relations. On the one hand Borneo is taunted as "a heaven of racial harmony" and in the absence of informed argument to prove otherwise, this observation seems to hold. On the other hand trends indicate that ethnic consciousness and ethnocentrism seem to be on the rise. Some examples of these are the emergence of ethnic-based cultural revivals, and the importance of ethnic politics. At this point these trends do not seem to jeopardise racial harmony. The question as to whether this harmony is founded on a deep seated value-based commitment to coexistence (unity in diversity) would be important to know. In other societies the primordial appeal has proven to be very strong whenever conflict of interests or competition bring groups into opposition with each other.

One interesting feature of Borneo ethnic groups is their minority status - minority in the economic and political sense and minority in the sense of population size. This minority status has implications in their role in national development. Questions such as how national policies are sensitised to their particular needs and conditions, how they adapt to the embrace of the market economy, and ability to sustain a livelihood in their traditional territories are some of the more urgent questions which projects under this programme would attempt to answer.

A project to study the Sihan's adaptation to the market economy and dwindling resource base has been hampered by the difficulty in accessing the Sihan community. The Sihan is one of the smallest ethnic group in Sarawak. They numbered about 150 persons in 1995. The initial stage of the study highlighted many problems of adjustment to main

stream economic life. The research team still hopes that the project could be reactivated once access to the community is possible. The plan for the future includes more of the Sihan-type studies of other small groups in the Kapit and Miri Divison and in Sabah.

Gender

The trend in Malaysia is for researchers to address the gender issue in the context of industrialisation. In Borneo a few works have looked at the role of women in traditional societies. Some of these studies have highlighted the important place women play in the traditional production system. The gender research programme would capitalise on the opportunities to undertake comparative studies between ethnic groups and groups in varying stages of modernization.

Cultural Tourism and Eco-tourism Impacts on Communities

In 1996 the faculty successfully bided for an IRPA grant to support a study of the impact of cultural and eco-tourism on the rural communities. Tourism is gradually gaining its importance as an industry in Sarawak and two of the main tourism products are the indigenous culture and nature. The "consumption" of these products by tourist inevitably involves an intrusion into the life of communities which form part of the products.

Although the inclusion of the rural communities in the industry opens new economic opportunities the income generated from this source is limited in comparison to the other cash-oriented rural activities. However because there is no single rural economic activity which can provide a sufficient and stable income, tourism broadens their alternatives.

Tourism certainly is a harbinger of change. It has the potential to change the rural peoples' world view and perception of themselves and others. However because the industry exploits some of the social values and cultural practices, the ugly consequences of cultural commercialization have threaten to appear in these communities. The fieldwork for this project includes the most developed cultural tourism area of Skrang and Lubok Antu, in the Sri Aman Division and the eco-tourism area of Mulu in Miri Division.

RESEARCH COMMUNICATIONS

A. PUBLICATIONS

Dimbab Ngidang
Native Customary land Rights, Public Policy, Land Reform and Plantation Development in Sarawak.
Borneo Review, Vol.8 No.1, June 1997, 63-80

This paper highlights a paradigm shift in native customary land development in Sarawak. The major thrust of this new approach of land development is the concept of joint venture company (JVC) which involves the participation of the private sector in native customary land development. Fragmented native customary lands are consolidated into a land bank and given a master title. The major role of the government is to act as a trustee to safeguard the rights of native customary landowners. Through the deed, the government is empowered to transfer native customary land rights to a corporate ownership for a period of 60 years. The land will revert back to the landowners once the lease expires. In this partnership, landowners hold 30 percent equity, 60 percent by a private investor, while the remaining 10 percent is held by the government.

E.S.Sanggin, A.R.Abdullah, G.T.Noweg, S.K.Kiai
The Highlands Kelabits: A Community Adapting to Change.
In *A Scientific Journey through Borneo : Bario - The Kelabit Highlands of Sarawak. G.Ismail & L.Din, eds., Pelanduk Publications, P.J, Malaysia. 1998*

The article examines existing socioeconomic structure of the Kelabit community in Bario. The findings of the study confirm many of the past findings with regard to the impact of religion and education on the lifestyles of the people on the Highlands. Agriculture is still the foundation of the economy of the highlands.The findings also suggest that the future of rice cultivation could be jeopardised by several factors such as the problem of labour shortage, the encroaching logging activities, and marketing and transportation problems.Two major forces of change have impacted upon the society, these are religion and education. These forces had modified not only the values and beliefs, but also had induced changes in the demographic structure of the community.

G.T. Noweg, A.R. Abdullah, S.E. Sanggin
Some Wild Vegetables Commonly Collected and Used by the Kelabits in Bario.
In *A Scientific Journey througfh Borneo : Bario - The Kelabit Highlands of Sarawak. G.Ismail & L.Din, eds., Pelanduk Publications, P.J., Malaysia. 1998*

Shoots, leaves, fruits and roots of many wild plants were widely collected and cooked by the Kelabits. Although most of these plant species are also utilised by other native communities throughout Sarawak, there are a few which are not known to people outside Bario. A total of thirty species most commonly harvested or collected were recorded during the fieldwork. The parts of these plants which were utilised, how they were prepared and their traditional significance were discussed based on information provided through interviews with the users. Considering the diversity of wild plants which were consumed as food, it could be implied that the Kelabit communities of Bario is somewhat dependent upon their forested surroundings for their livelihood.

Hew, S.M & S. Mariam
Gender Aspects of Labour Allocation and Decision-Making in Agricultural Production: A Case Study of the Kelabits in Bario Highlands, Sarawak. In *A Scientific Journey througfh Borneo : Bario - The Kelabit Highlands of Sarawak. G.Ismail & L.Din, eds., Pelanduk Publications, P.J., Malaysia. 1998*

The Kelabits, numbering approximately 5,000, occupy the highlands of the Baram District in Sarawak, with Bario constituting the largest settlement. Much of their economic activitiy revolves around agricultural production. Due to the outward migration of its own people and the migration of workers from across the Indonesian border, the Kelabits are now at the crossroads of change. This study invistaged the impact of these changes on gender relations in the context of agricultural production as well as to understand the role outward migration and immigration of foreign labour play in agricultural production.

Raja, G.
Development of Human Resources for the Effective Implementation of the Domestic Violence Act.
Faculty of Social Sciences Occasional Paper No.03/97

Passing legislation is just one stage in the process of dealing with the problem of domestic violence. Crucial to meeting the objectives of the legislation is the development of human resources to implement the Act, not only in name but also in spirit, so that constructive support is given to families where violence is no stranger. This paper outlines areas of human development which need attention and some of the constraints to such developments. By being aware of the resource implications from the outset, it is contended that steps can be taken to hasten the effective implementation of the Act.

Tan, K.H.
The Newspaper Industry in Sarawak: An Economic Perspective.
Faculty of Social Sciences, Occasional Paper No.1/97

There are 15 daily and weekly newspapers in Sarawak. However, very little is known about this industry. This study seeks to bridge the gap by exploring various factors of change which have influenced the growth and dynamism of the industry. Specifically, the aim of this paper is to study the dynamics of the newspaper industry from the economic perspective within a 10-year time frame. Based on interviews with officers in the Sarawak Labour Department; key personnel of major newspaper firms; and basic research undertaken at the Sarawak Department of Statistics and the Sarawak Labour Department, the paper tries to discern and delineate some crucial trends, growth patterns and agents of change within the industry.

Ngidang, D. & A.R. Abdullah, 1997
Rural Cooperative Societies and Community Development in Sarawak.
Rural Development and Social Science Research: Cases From Borneo In V.T.King, ed..

The rural cooperative movement in Sarawak was established in the 1940's. Originally, the movement was seen as an important vehicle for pooling human, material and financial resources so as to promote socio-economic development among the indigenous communities of Sarawak. In recent years, the rationale of the movement and its growth have

shifted its emphasis from rural-based to urban-based activities.Two important features are noticable in the cooperative movement in Sarawak. First, the movement has somewhat abandoned its original social objectives in favour of pursuing economic goals. The second feature is the movement's scope of operations in Sarawak. Despite many economic opportunities awaiting to be exploited, many ryral cooperative societies are breaking up due to financial constraint, lack of organizational skills, and poor leadership and management.

Ngidang, D. & Fett, J., 1995
Inter-organisational Communication Problems in Integrated Rural Development Projects.
The Journal of Development Communication, No.1,Vol.6,June, 1995, 1-11.

This article attempts to make the case that some of the major rural development communication problems exist at the inter-organisational level. The nature of these problems is pointed out. There is no ready solutions to these problems; most are common to all organisations, not just those involved in rural development. The majority stem from the feeling that it is in the best interest of the organisation to limit inter-changes and operate in an autonomous fashion. If self-interest dominates, it must become in the interest of individuals and organisations to cooperate. This is most apt to come about when organisations - individually and collectively - play a major role in integrated development project planning. Agency personnel need a feeling of project ownership. For this to happen, a policy of decentralisation is needed.

Ngidang, D., 1995
The Politics of Development in Longhouse Communities in Sarawak, East Malaysia.
Development in Practice, Vol.5, No.4, 1995.

In rural development, political policies do not necessarily match project beneficiaries' needs and goals. One reason is the rural people's lack of political power to influence policy decision that affect their livelihood. If rural development is to benefit these people, upward influence in policy decisions should go hand in hand with development policies. Ideally, both government agents and politicians should commit themselves to support the people's agenda, and any government intervention should reflect political response to grassroot demand.

INTRODUCTION

The Centre for Language and Communication Studies (CLCS) which was established in 1996 aspires to become a centre of excellence in language and communication research and scholarship in Malaysia and the Asian region. The Centre provides research facilities covering a wide range of fields in language, linguistics and communication studies. Research interests include linguistics, language teaching, language acquisition and language learning, ethnolinguistics, systemic functional linguistics (educational linguistics/discourse analysis), corporate communication, new communication and information technologies, communication and culture.

In language, our research programmes are focussed on linguistics, the study of language in all its form. It is concerned with the way speech sounds are produced and transmitted, the way speech sounds operate in a system to produce meaningful utterances, and the way in which grammatical forms and vocabulary items are used in different varieties of language. Such studies may be confined to a particular speech community at one stage in its history, or they may transcend the boundaries of geography and time to include comparative studies as well as investigations into the nature of language in general. Research has also focused on the study of language acquisition among children and language learning among adult learners. Our knowledge on the cognitive aspect of language study enables us to gain insight into how people learn language which in turn helps us in designing an effective language teaching programme. Research is also carried out on the social aspect of language both at the micro level (the study of ethnography of communication and discourse analysis) and at the macro level (the study of language variety, language education and language planning) in order to look at how language functions in society.

In communication research, the Centre focuses on the management of human ability to function effectively in social and increasingly communication-rich environment vis-à-vis in the field of interpersonal, organizational, corporate, new technologies and communication cultures. Media and policy studies also form part of the Centre's communication research areas.

RESEARCH PROGRAMMES

Affective Intervention Strategies on Reading Interest, Pleasure and Accuracy

For most Malaysians, reading has merely been a cognitive exercise that focuses on the individual's ability to memorize a script and tremendous pressure is set upon them to acquire

accuracy of pronunciation, spelling and the meaning of a word. A stereotype reading session in school would picture children sitting in rows and reading in complete silence or a chorus of thirty-odd children parroting along noisily for several minutes. Such stereotype activities have robbed the joys of reading, resulting in the prevalent apathy among students to read anything at all. Reading is meant to be pleasurable and a source of information, of imagination, of security, of dignity, and of independence. A study aimed at ascertaining the use of affective intervention strategies in reading effectively has been initiated. This should decrease reading deficiency, increase reading interest and accuracy, and achieve independence in reading. The instrument used to gauge reading deficiency, interest, accuracy and independence is the Diagnostic Survey.

The study is founded upon the assumption that the effective use of affective intervention strategies can increase reading interest, pleasure and accuracy leading an individual to become an independent reader. These strategies stress the importance of antecedents and their power to control behaviour, the importance of a responsive social context for learning, the opportunity to initiate, opportunities for responsive feedback, implications for structuring learning opportunities and the opportunity for reciprocal gains in interactive skills. Affective intervention strategies involve the stimulus conditions within the physical and social context of the classroom for teachers, which embrace the following areas: ***i***. Adheres to the methodology of applied behaviour analysis, ***ii***. Recognises the importance of naturalistic antecedent events, ***iii***. Strives to maximise the use of naturally occurring reinforcers, ***iv***. Responds to empirical evidence from non-behavioural theoretical perspectives, *v*. Emphasises the mutuality and reciprocity of behaviour in learner/tutor interactions, ***vi***. Seeks to assist individuals to assume a greater degree of control over their own learning, ***vii***. Focuses on broader educational issues than just schooling, ***viii***. Encourage initiations by the learner, ***ix***. Values the learning opportunities provided by errors and ***x***. Recognise the complex professional skills required of tutors.

Attitudes Towards Language in Teaching at Tertiary Level

Of late, there has been suggestion from the Malaysian government that English should be used to replace Malay as the medium of instruction in the teaching of scientific and technological subjects at tertiary level. The reason is that it is easier to teach the subjects in English as more reference materials are in English. The purpose of this research, then, is to determine to what extent this suggestion has been accepted by local academicians, taking UNIMAS as the locale of the study. Preliminary finding shows that, based on language attitudes, there are three groups of academicians : those using English, those using Malay, and those using both languages in teaching. Their attitudes, to a certain extent, are influenced by their educational background and their language proficiency. Generally, those with strong English educational background and who are more proficient in English would prefer to teach in English. Those with strong Malay educational background and who are proficient in Malay would prefer to teach in Malay. In addition, it is observed that the academicians have their own reasons for using the language of their choice in teaching with one common goal - to help their students to gather as much knowledge as possible.

RESEARCH COMMUNICATIONS

A. PUBLICATIONS AND CONFERENCE PRESENTATIONS

Jamali Ismail
Management of TESL Programmes in Malaysian Universities : Striking a Balance Between Expectations and Reality
1st ASEAN Symposium on Educational Management and Leadership, Genting Highlands, August 1997.

The Bachelor in TESL programmes have been in existence in Malaysian universities since early 1980's. Basically, they comprise two major components - applied linguistics and education, a general feature that appears in most of the universities concerned. Although many graduate teachers have been produced so far, not all is well in the running of the TESL programmes. Firstly, within the present education system and on entry, it is not

easy for the universities to find a sufficient number of candidates good enough in English, yet they are expected to produce teachers sufficiently proficient in the language. Secondly, the universities have to increase their annual intake to meet the demand for ESL teachers. In doing so, they sometimes have to "scrape the bottom of the barrel" and to provide enough space to accommodate the big number of students. Thirdly, to produce enough teachers within a short period of time, the duration of study has been reduced from four to three years. Consequently, lectures have to be conducted even during the long vacation; students thus end up without leave, as lectures have to be crammed within the three years duration. Finally, most universities do not have enough academicians to handle the growing student population. People are just not interested to join a profession which, to them, is not attractive in terms of remuneration and terms of service. Thus, the issue is how far can the universities go in striking a balance between expectations and reality. Several measures have in fact been taken to remedy the situation, e.g. by introducing TESL matriculation programmes, and using new technology in teaching, among other things. Some degree of success has been achieved, yet some problems still remain to be solved.

Florence G. Kayad
Language Learning Strategies : The Malaysian Perspective
RELC Seminar 1998 on Language Teaching : New Insights for the Language Teacher,Singapore, April 1998.

This paper reports the findings of an investigation of the language learning strategies (LLS) reportedly used by proficient and less proficient ESL learners from the first year undergraduates at Universiti Malaysia Sarawak (UNIMAS). Subjects were selected from the top and bottom quartile based on the university English placement test results. Data were collected by means of a survey questionnaire adapted form Oxford's Strategy Inventory for Language Learning (SILL) version 7.0 for learners of English as a second/foreign language. Subjects were asked to self-rate, on a five-Likert scale, their frequency of use of the fifty strategies listed. The results of the study show a pattern of strategy use in relation to second language proficiency level. Although there seemed to be no significant difference in the overall strategy use by both proficient and less proficient learners, significant differences were found in the use of the six broad strategy categories on the SILL. Some strategies were used more often by proficient learners while some other strategies were used more often by less proficient ones. The pedagogical implications of the findings are discussed.

Peter F. cullip
Text Technology : The Power-tool of Grammatical Metaphor
RELC Seminar on Language Teaching : New Insights for the Language Teacher, Singapore, April 1998

Texts are a form of technology : they do things. They construct meanings to achieve social purposes. In this paper I shall argue that the power-tool of the technology of text is grammatical metaphor. It is grammatical metaphor which is the key to construction the meanings of those genres valued by the institutions of education, the professions and bureaucracy. Success in these institutions is linked to the mastery of grammatical metaphor as a tool for making meanings in reading and writing. It is therefore important for teachers, including ESL teachers, to become conscious of this tool, how it works, how to use it and how to exploit it for pedagogical purposes, so that all our students can master it, and the kinds of texts it enables them to construct.

Jamali Ismail , Chan Swee Heng, Rosli Talif, Ain Nadzimah Abdullah and Sharifah Zainab S. A. Rahman
The teaching and Learning of English : Lesson and Solutions

The book is based on a research project which aims to investigate the teaching and learning of oral skills in primary schools. Specifically the project aims to conduct a preliminary study on the existing situation in the teaching and learning of English through confirmatory exercise and a review of existing studies, intervene in the teaching and learning of oral skills in English through prepared lessons and materials, and to evaluate the effectiveness of the intervention exercise. The sample population for the project comprised Standard Five children and teachers of primary schools in specified districts of Selangor. Qualitative and quantitative methods such as questionnaire surveys, interviews, trialling and evaluation of materials were used. Some of the findings of the

study were suggestions on how to overcome weakness in the teaching and learning of the oral skills, and a redefinition of what it means to be proficient in the oral skills in line with national aspirations.

Peter F. Cullip
Systemic : Fresh Perspectives on Language and Learning.
***UNIMAS Today*, Vol. 3, no. 3, 14 - 15.**

As more and more classrooms in Malaysia move away from traditional curriculum practices towards learner-centred progressivist pratices, signigicant numbers of students are being left behind. In this paper I sketch a model of language and language learning which forcefully presents itself an alternative to progressivism. Systemic functional linguistics offers teachers a coherent model with which to plan teaching and learning practices across all subjects and levels of the curriculum in a way that makes explicit to ALL students, the different ways in which meanings are made in grammar across a range of different contexts.

Shawaluddin bin Anis
Communication in Organization. The Network of Communication ties (Cliques, liaisons, bridges and isolates) Among Decision-Makers in Deconcentration System of Policy Making
The 5th Communication Research Symposium, Globalization and Communication Challenges in the next Millenium. Bangi, December 1997.

This paper attempts to address two major questions in the field of interpersonal communication network among decision-makers or referred to in this paper as "actors" within the network of decision-makers. Sociometric data were analyzed using UCINET microcomputer programming to address specific questions such as: *(a)* what was the nature of relationships between group attitudes and group cohesion among decision-makers within those who were involved in determining policy direction, *(b)* were there any communication ties based on grouping such as the presence of cliques, liaison, bridges and isolates among these decision-makers and to what extent they have influenced over certain policy directions?

The findings revealed that there were three major relationships of attributes and group cohesions associated in this study. They were: *(i)* differences of strength of influence between the decision-makers, *(ii)* the popularity of the decision-makers were inter-connected within the hierarchical network and *(iii)* there found to be common linkages among decision-makers reflecting the similarity of attitudes and preferences to each other within the network. In terms of communication ties, within the matrix of 88 decision-makers in the organization's upper management echelon measured, there found to be at least 65 possible major cliques, 12 other additional subgroups within the cliques, 1 liaison, 9 bridges and 7 isolates.

Shawaluddin bin Anis
The role of media in the management of a Malaysian civil society.
National Conference on Media and Civil Society. Shah Alam, October 1997.

The discussion of this paper focuses on the process of the diffusion and dissemination of the concept of civil society. Understanding the role of media helps us realize the process of change towards a more and just civil society effectively. The management of change within society has never been easy. Its has its own unique characteristics and thus need be addressed accurately. The concept of input, process and output within the civil society becomes relevant and thus media has a significant role in making a Malaysian civil society works.

Shawaluddin bin Anis
Corporate communication: Leadership through public relations strategies
International Conference on Managerial Leadership Baharin, June 1997.

This paper attempts to discuss how organizations are affected by changes in the environment and how corporate communication lead to counter these changes. Significant roles in corporate strategies, responses to the pressure of public opinions which has its roots in attitude changes are discussed at length. A Malaysian case study is cited as an illustration of the above case. Further discussions of the paper include the understanding of group functions, and group characteristics as unit of analysis. The paper further describes the notion of many "publics" and revealed as why this is significant to organizations to learn from the practice of public relations in providing organization's leadership in dealing with its unfriendly environment.

Shawaluddin bin Anis
Malay as a language of communication
Seminar "Bulan Bahasa" Sri Aman, Ogos 1997.

This paper discussed the role of Malay language which is the lingua-franca spoken by about three hundred million people in the region. Therefore, discussion is focused on the role of Malay as an instrument of communication. Analysis of communication in terms of its processes, the transference of reality, the use of empirical and symbolic experiences and the shared meaning and beyond was discussed in great length.

Shawaluddin bin Anis
Multimedia Technology in Action: A UNIMAS experience
Educational Technology Conference 1997, Serdang, Selangor, November 1997.

UNIMAS prides itself in its effort to integrate multimedia technology in its teaching-learning activities. On the global perspective, technology in education, especially at the higher educational institutions, is seen as a powerful tool to boost cognition levels among students and instructors. An insight into the academic ecosystem envisioned by the vice-chancellor of UNIMAS, which spells out the university's aspirations, is included in the paper. Reid (1997) suggests for a strategy to develop an information style, create values to promote information uses, make full use of information technology and systems, and acquire knowledge of the world of information. At the university, all these objectives can be achieved due to its competitive edge, in terms of environment, focus, leadership and differentiation. The paper ends with a look into current challenges faced by UNIMAS academia, such as rapid productivity rate, pedagogical implications, distance and open learning options, and advancements in technology that supercedes planning and implementation agendas.

Mohamad, F.S.
Empowering Learning via Linguistics and Communication: A Cyberwalk into the 21st century
ASAIHL Seminar 1997, Kuching August 1997.

Emerging technologies are currently available to assist teaching-learning activities, and technology in general is beginning to assume a stronger role in making the process of learning more efficient. The key factor that separates quality learners from the mediocre rest in their ability to effectively interpret theories and skills they learned in their programmes of study into relevant avenues of meaning-making in the working world (Fairclough, 1989:235). Taking this into consideration, the Centre for Language and Communication Studies at Universiti Malaysia Sarawak created a mission that translates its aspirations based on educational needs and challenges that cater to the increasing demands for technology. Focusing on language and communication studies, the Centre plans to empower its students with adequate knowledge and skills to challenge the demands of the next millennium.

Mohamad, F.S.
Instructional Design and Analysis of Materials for Multimedia Learning Environments
South East Asian Ergonomics Conference 1997, Kuala Lumpur, November 1997.

The emergence of multimedia technology has created options for teaching and learning opportunities worldwide. The idea of interacting with learning materials becomes one of the many attractions for teacher educators in get involved with multimedia environment. New issues came forth - how do we evaluate the effectiveness of interactive materials for multimedia learning environments? How do we create suitable instructional materials to enhance the capability of the traditional learning environment? How do we define the role of the teacher in a multimedia learning environment? This paper discusses potential strategies to be adopted for teacher trainers to integrate the potentiality of multimedia learning environments pragmatically into their teacher education programmes.

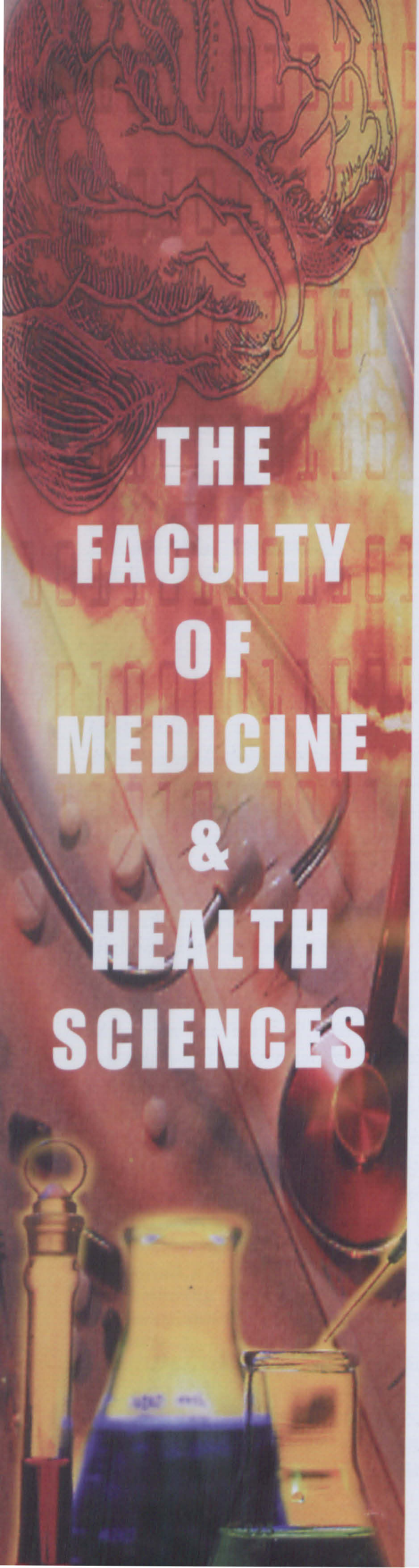
Mohamad, F.S.
Using Multimedia in Language Learning: A Marriage Made in Cyberspace?
Society for Information Technology and Teacher Education International Conference 1998, Washington, DC USA, March 1998.

The emergence of multimedia technology of late has created new and innovative options for teacher educators worldwide to optimize interaction between language learners and their language learning curriculum. Language proficiency is not only

monitored via face-to-face interaction, but also through cyberspace communication. Today, for instance, the electronic mail (e-mail) program serves as a common communication tool for teacher-student discussions. With the launch of Malaysia's Multimedia Super Corridor project in August 1996, local educators are feeling the ripples of the cyberwave demands through the introduction of the "smart school" project as a public education medium. However, questions arise from the administrative and training perspectives: are the teachers ready for the change? And, are teacher educators trained to research look at the issues faced by teacher educators at a new university in Malaysia, Universiti Malaysia Sarawak on their attempts to integrate multimedia technology into their curriculum. An overview of the academic ecosystem envisioned by the university will also be analyzed to understand the expected roles of the teachers and instructors at the university. The paper centers on the need to answer demands for a more IT-based curriculum, and steps taken by the university to facilitate its students to meet challenges of the information age. The paper ends with more questions on defining the rapidly changing roles of teachers and learners, and potential solutions to meet more challenges to adapt into the world of information technology in the next millenium.

Mohamad, F.S.
Adding a Malaysian Flavour to ELLIS: A Project with TESL students
TESOL Convention 1998, Seattle, Washington USA, March 1998.

Using ELLIS courseware as the main language learning package, students from the TESL programme (Teaching of English as a Second Language) here in Universiti Malaysia Sarawak were assigned to analyze the feasibility of integrating the courseware directly into a smart-school learning environment (to be fully implemented in 1999 at all Malaysian schools). This presentation focuses on material development issues that arise as the projects were conducted. Sample lesson plans are constructed, and teaching strategies are proposed to enable effective use of the courseware in the classroom environment. Additional materials and hands-on activities are designed to facilitate learners of English to acquire skills of the target language efficiently.



THE FACULTY OF MEDICINE & HEALTH SCIENCES

INTRODUCTION

While the faculty is committed to developing and implementing its innovative problem- based learning curriculum, a considerable amount of efforts is rendered by the academic staff towards research activities. At the faculty level, a Research Committee coordinates and oversees the research activities and postgraduate teaching. Current research interests of the Faculty include molecular medicine, medical education, nursing, behavioural medicine and several aspects of infectious diseases and public health issues. Its major sources of research funding come from the university seed grants and the Ministry of Sciences and Technology under the Intensification of Research in the Priority Area (IRPA).

RESEARCH PROGRAMMES

Molecular Medicine

Research activities on molecular medicine have focused primarily on the molecular dynamics of diseases. The faculty works in close collaboration with the Institute of Health and Community Medicine of the university. Currently, the Southeast Asia Ovalocytosis project attempts to characterize the red cell membrane defect among the local ethnic groups and the nature of the mutations involved. Another focus of research has been on the prevalence of HTLVI and HTLVII infection and the molecular aspects of viruses related to these infections. Research on lymphoma has also been initiated in collaboration with University Malaya and University Kebangsaan Malaysia.

Medical Education

A novel medical curriculum based on a problem- and community-centered learning curriculum is unique to the undergraduate medical course at UNIMAS. To ensure relevance and effectiveness of our medical education through curriculum development, the faculty members have consistently been involved in the critical and innovative evaluation of the new curriculum. Assessment of medical students exposed to this innovative education concept in the areas of early clinical exposure has been initiated.

Tropical Medicine and Parasitology

Research in tropical and parasitic diseases has concentrated mainly on two major infectious diseases of local importance, dengue and malaria. Taking a central position in our research efforts has been the understanding of the population biology of mosquito vectors and the disease transmission dynamics. Works on the vector ecology, epidemiology and genetics have been carried out in many parts of Sabah and Sarawak. A research project on improved methods for dengue vector surveillance is being supported by an IRPA Grant and allows

collaborative research to be forged between James Cook University of North Queensland, Australia and Sarawak Health Department. New Aedes indices on dengue vector surveillance have been developed under the first phase of field research. With the commencement of the second phase, the generated new Aedes indices will be field-tested for their sensitivity and reliability.

A project on impact of oil palm development on malaria vectors has also been completed. An unexpected revelation from this study was the "law of unintended consequences" which simply states the existence of two opposite outcomes of oil palm development with respect to vector incidence and development, namely the reduction of malaria vectors accompanied by a concomitant increase of dengue vectors. In a study carried out during the expedition to the Bario Highlands, a total of 31 species of mosquito immatures were identified in various water habitats. A comparative study on Anopheles vectors with special reference to malaria transmission in Gunung Silam, Sabah was also carried out in 1996. A preliminary survey on the intestinal parasitic infections among school children in Bario Highlands and Serian revealed the extent of parasitic infections that prevail in ceratin communities of Sarawak.

Whilst much of our research efforts have been devoted to understanding the descriptive epidemiology of malaria and dengue, the major thrust of our study has recently shifted to the genetic diversity of Anopheles vectors and malarial parasites. An understanding on the role of genetic diversity in disease vectors and its influence in the epidemiology of disease is being addressed. Through a collaborative research with the Department of Biology, University of Leeds on the phylogeny of the Dirus complex and gene exchange, we have isolated microsatellities from a genomic library of An. dirus, an important malaria vector in mainland Asia. Species-specific microsatellite probes tested in natural populations of An. leucosphyrus and An. balabacensis collected from Sarawak and Sabah respectively, produced encouraging results and have led to the speculation that these microsatellities could probably be used as population markers at the population level.

In the phylogenetic analysis of An. leucosphyrus group, vectors collected from Lambir National Park, Miri and Trenggus, Bau, were both identified as An. macarthuri. Their DNA sequence data suggested that these specimens are not identical and it is highly probable that An. macarthuri from Lambir Park has been misidentified and should be assigned to the nominate taxon, An. riparis.

In collaboration with the School of Public Health and Tropical Medicine, James Cook University of North Queensland, we plan to study the population dynamics and genetic diversity of the malaria parasites, Plasmodium falciparum and P. vivax within anopheline vectors. Description of the genetic structure of parasite populations is central to an understanding of the effectiveness of bednets and transmission-blocking malaria vaccines. A major thrust of this project is to estimate the rate of cross-fertilization between different genotypes of P. falciparum and P. vivax within the vector and human host population in the Lundu, Sarawak.

A multidisciplinary research project on modeling the relationships between malaria incidence and environmental determinants using Geographical Information System (GIS) and Remote Sensing (RS) techniques is currently been pursued. The aim of this research is to develop a prototype of GIS to monitor and predict malaria risk.

Community Medicine

Rapid development, industrialization and urbanization have resulted in significant changes in lifestyles of the Malaysian population which subsequently induced changes in diseases patterns. Sarawak is unique because of its vast and diverse geographical areas and ethnic populations. This makes available an array of interesting research opportunities that can be pursued uninhibited. For example, infectious diseases which predominated admissions and causes of death prior to 1980, still remain an important public health concerns in Sarawak and Sabah. At the same time the incidence and prevalence of certain diseases associated with changing lifestyles and altered environments are known to continue on the rise. The focus of the community health research at UNIMAS has been in the areas of epidemiology, family health, environmental health and socio-behavioural aspects of illness. Research conducted by the staff in the last five years among others include ***i***. Diabetes in Serian and Kuching areas, ***ii***.Prevalence of atopic diseases, skin infection, anemia, iodine and vitamin A deficiency in Bario, ***iii***. Prevention of cardiovascular diseases in Kota

Samarahan, ***iv***. The effect of environmental tobacco smoke on the fetal growth, and ***v***.A study on the native's health profile in Sarawak.

Behavioural Medicine

A number of research projects have been carried out in the area of behavioural medicine. As our Faculty focuses on health issues that are community-oriented, our research approach to patient care also tends to be holistic and multi-disciplinary. These are exemplified by our studies on the perception of ethnic groups regarding health and diseases, the impact of smoking on health and behavioural disorders among children and adolescence.These projects provide ample opporunities for faculty staff to establish contact with the community thereby enhancing preventive and curative measures in managing these disorders.

At the hospital level, work is now in progress assessing patients' complaints of insomnia and their related health problems. The setting up of the sleep laboratory supported by IRPA grant has made it possible to objectively evaluate and recommend remedial measures to the referred patients. Since the sleep laboratory was set up in late 1996, patients with varying degress of obstructive sleep apnoea and patients with secondary generalized seizure have been identified and treated accordingly.

Under the promotion of healthy lifestyle programme, supported by IRPA grant, some faculty staff are now starting research projects concerning adolescence psychosocial problems, evaluation of national cancer control strategies, behaviour modification among adolescent smokers and family environment of problem school going adolescence.

Nursing

Priority areas in nursing research has been identified to include clinical nursing and health issues related to psychosocial problems. A multi-disciplinary research team has been formed to look at the psychosocial status of school-going adolescents and problems associated with adolescent groups in Sarawak. A project in collaboration with the Faculty of Social Sciences was initiated to identify effective strategies in health development and provision among rural women through community participation.

RESEARCH COMMUNICATIONS

A. CONFERENCE AND SEMINAR PRESENTATIONS

Hashami Bohari, Mohd Amin Shariff, Awang Ismail Awang Mahmood, Rasli Bujang, Rogayah Tamel & Syed Hassan Almashoor
Cardiovascular Risk Factors in Samarahan District, Sarawak, 1996
4th National Community Health Colloquium, Hospital Universiti Kebangsaan Malaysia, Cheras, 8-9 September 1997

A cross-sectional study was conducted in five Malay and Iban villages in Kota Samarahan Sarawak in 1996. The objective of the study is to identify the prevalence of the main cardiovascular risk factors in the area. The study areas are Kg. Tambirat, Tg Bundung, Melaban, Sampon Kelili, and Sampon Geronggang. The data was obtained through guided interviews, measurement of height, body weight and blood examination for cholesterol and glucose. A total of 643 individuals were interviewed. The majority were males (52.3%), Malay in ethnic group (71.5%), farmers (63.3%) with the mean age of 47.4 year (SD 13.7 years) and median income of RM 100.00 per month. The study found that the overall prevalence of hypertension was 18.9%, smoking 34.9%, regular alcohol drinking 19.3%, obesity 24.0%, abnormal blood glucose 42.0% and abnormal cholesterol 32.5%. The prevalence rate differs significantly ($P<0.05$) among different villages, ethnic groups and gender.

Hashami Bohari, Mahmoud Amin Shareedeh, Awang Ismail Awang Mahmood & Syed Hassan Almsshoor
Exposure to tobacco smoke and low birth weight: A case-control study at Sarawak General Hospital 1997
4th National Community Health Colloquium, Hospital Universiti Kebangsaan Malaysia, Cheras, 8-9 September 1997

A case-control study was conducted among women who delivered at Sarawak General Hospital to identify the association between exposure to tobacco smoke and low birth weight. The study was conducted between January to December 1997. All women who had their babies weighing less than 2.5 kg at birth were taken as cases' samples. The controls were selected among those who delivered in the same hospital and were matched for their day

of birth, gender and ethnic group with the ratio of 1: 3. A total of 104 mothers with full term low birth weight babies and 91 mothers with premature low birth weight babies were interviewed. The total number for control samples were 528. A total of 10 mothers were found to be smoking during pregnancy and 7 others who denied smoking but their urine were positive for cotinine. The study found that low birth weight were noted to be more common among girls, natives in ethnic grouping, gravida less than 5, lower socio-economic status, had past history of low birth weight in the family and had a history of smoking among members of the family. The rate of low birth weight among samples with no family history of smoking was 4.1%, much lower than those who had family history of smoking; particularly history of smoking among the fathers (10.9%), mothers (50.0%) and other members of the family (10.3%).

Hashami Bohari. Syed Hassan Almashoor, Mohd Amin Shariff, Henry R Gudum, Mariah Ahmad, Awang Ismail Mahmood, Dayang Norelia Julaihi and Mohamad Abdul Rahman
Perceptions toward symptoms and utilisation of health facilities among natives in rural Sarawak
The Fourth Asia-Pacific Social Science and Medicine Conference, 22 June - 16 June 1998. Yogyakarta, Indonesia.

A cross-sectional study was conducted in rural areas in Sarawak to identify the perception patterns in relation to symptoms among the natives. Information was collected through guided interviews by trained interviewers between January to June 1996. Samples were selected by multistage sampling. A total of 635 samples were interviewed. The majority of the samples (58.9%) were males. They comprised of Malay, Iban, Bidayuh. Melanau, Kayan and Orang Ulu. The majority of the samples (65.2%) had low formal educational background. Most of them worked in agricultural sector (83.3%) and earned less than RM 200.00 per month (74.3%). The study found that the majority of the samples (78.7%) had experienced symptoms two weeks prior to the study. About 45.5% of the samples experienced more than one symptom. There were significant differences ($p < 0.05$) in terms of number of symptoms with geographical areas, ethnic groups, religions, and distance from the nearest health facilities. However, the number of symptoms differed in terms of gender, formal educational backgrounds, types of occupations and income were not statistically significant ($P>0.05$). The study also found the variety of symptoms differed significantly among the various ethnic groups and the types of health facilities available. Results indicating differences in perception of symptoms among the sample groups may affect their compliance towards medical treatments of symptoms and diseases.

Chang Moh Seng, Hassan A Rahman & Tanrang Yusin
Biting activity of Anopheline species in Gunung Silam, Sabah with special reference to malaria transmission.
International Symposium & Workshop on Conservation Biology, 19-23 November, 1995, Kuching

As part of the scientific expedition, Kg. Silam, Kg. Lamak and Kg. Tompinau, all situated within 10 km east from the foothill of Gunung Silam Sabah were chosen for the mosquito study. The study encompassed species composition and abundance, biting activities, host preferences and larval breeding profiles. Malariometric survey using mass blood survey in three selected villages for disease prevalence was also conducted. Malaria vectors, *Anopheles balabacensis* and *An. sundaicus* were positive with sporozoites. Malaria parasites, both *P. falciparum* and *P. vivax* were prevalent in all villages surveyed. Malaria endemicity varies with the geographical and ecological terrain and correlated well with the mosquito species distribution and abundance. In the foothhill, An. balabacensis was the responsible vector, while in the coastal plain, it was the *An. sundacius*.

Chang Moh Seng, Leo Lim, Nagum Jute & Patrick Ingot
Impact of Permethrin-impregnated mosquito nets on host-seeking behaviour of Anopheles donaldi and An. letifer in mesoendemic malaria area of Sarawak.
XIVth International Congress for Tropical Medicine and Malaria, 17 November to 22 November 1996, Nagasaki, Japan

Published data on the host-seeking behaviour of the malaria vectors, following the community wide-use of permethrin impregnated bed-nets are lacking. These data are essential in undertanding the impact of insecticide treated bed-nets on the vector populations. A study on host-seeking behaviour of *An. donaldi* and *An. letifer* in two groups of villages: 4 permethrin-impregnated bed nets and 2 DDT

sprayed villages was conducted. Mosquitoes were caught using CO2 baited light-traps set near the human dwellings. Engorged specimens caught resting outdoor at both villgaes were used for blood meal identification using enzyme-linked immunosorbent assay (ELISA) tests. A community malariological blood smear surevy was also carried out. Both *An. donaldi* and *An. letifer* consistently showed higher rates of trapping outdoors than indoors. The indoor trapping rate in permethrin-impregnated villages showed a significant decline ($p < 0.05$). On the blood meal identifications, there was no significant reduction in mosquitoes positive to human antiserum in both groups of villages. Mass blood surveys in all age-groups established the continued transmission of malaria in all villages. Variation between the incidence of malaria infection irrespective of the intervention measures, seems to depend on social-ecological factors rather than on the particular form of vector control.

Chang Moh Seng
Dengue vector control in Southeast Asia and Western Pacific region; present status and future prospects.
WHO WRR/SEAR Bi-Regional Meeting on Prevention and control of Dengue fever/ dengue haemorrhagic fever, 14-17 July 1997, Manila, Philippines

One of the factors for the current global increase in dengue fever (DF) and dengue haemorrhagic fever (DHF) is the lack of effective vector control. Very few successful and sustainable *Aedes aegypti* control programmes exist in the Southeast Asian and Western Pacific regions. The programme should be based on the sound knowledge of the bionomics and ecology of the local vector populations, disease epidemiology and a horizontal integration within the general health services. As a public health prority, stringent control procedures for managing DF/DHF epidemics should be formulated and quality indicators developed. One of the pressing problems of dengue vector control in this region is the replacement of *Aedes aegypti* by *Aedes albopictus* as the vectors of DF/DHF. The peri-domestic and exophilic habitats of *Ae. albopictus* enables this species to exploit many natural and artificial breeding habitats in outdoor environment. Where one or both of the co-occurring *Aedes* species were suppresseded to a low level, the current indices lack the sensitivity to monitor *Aedes* populations in terms of dengue transmission. New, better or more appropriate indices are needed for improved surveillance. Ideally such an index should reflect adult abundance per premises as well as key container types. To fully explore this concept , a study on the *Ae. albopictus* breeding behaviour and habitats is required to generate a new larval index useful for the dengue vector control programme.

Chang Moh Seng
The emerging disease : Dengue and dengue haemorrhagic fever in Asia.
Scientific Seminar, 7 January 1998 , Department of Biology, University of Leeds, UK

A global pandemic of dengue began in Southeast Asia after the end of World War II. During the past 20 years or so, the frequency of epidemics had increased, and also the geographical areas had expanded. In Asia, epidemics of dengue haemorrhagic fever (DHF) occurred for the first time in India, Pakistan, Sri Lanka, Laos and China. There has been a recent resurgence of dengue/DHF in countries where dengue has been thought to be under control. The resurgence of this dreadful disease are probably due to several important factors. Increase of population in urban centres, inadequate water and waste management system and increase of air travel. The replacement of *Aedes aegypti* as vector of dengue and DHF by *Aedes albopictus* in both rural environment and urban fringe areas also contributed to the increase of dengue activity.

Syed Hassan Almashoor & H R Gudum, M Ahmad & M A Sharif
Assessment of pioneer students entrance to Medical Schools
International Conference on quality assessment in health professions educations, November 26 - December 1 1995, Manila, Philippines

The Faculty of Medicine and Health Sciences UNIMAS began registration of its pioneer batch of students in July 1995. Our Medical faculty is the fourth in the country and this is an opportunity to introduce 'innovative approaches to training of future physicians for the country. The educational philosophy and the goals of the curriculum are designed to enable the faculty to be an integral part of the health care system and to contribute to the development of health through excellence in education, service and research. The curricular approach is broad-based and student-centered with

emphasis on problem-based learning. The medical programme is community-oriented and the students are exposed early to clinical-teaching-learning activity. A total of 82 students applied to join the faculty as their first choice for medicine, and 56 students are selected for interview, based on their qualifications. Their examination results are evaluated and those who score acceptable merit points were invited for interviews. Semi-structured questionnaire were used to assess them personally rather than using their academic qualifications alone to gauge their suitability. Twenty-eight students finally registered as our students and they came from diverse socio-economic, ethnic and regional backgrounds. The faculty felt they have been adequately selected and what would occur over the 5 years medical course would be interesting to know. This is an attempt to assess the students suitability to do medicine and the faculty is opened to explore all avenue of medical school entrance assessment in the future.

Hashami Bohari, Syed Hassan, M Ahmad & J Subeh
Triple Jump Excise as a formative assessment in a problem-based learning curriculum in University Malaysia Sarawak
International Conference on Quality Assessment in Health Professions Education, 26 November - 1 December 1995, Manila Philippines.

Triple Jump Excise (TJE) is a form of formative assessment conducted primarily for obtaining feedback about the weekly learning activities from the students and staff. Such feedback provides an opportunity for modification of instructional methods or materials to facilitate learning when feedback indicates things are not going as planned. The exercise was conducted through a one hour assessment session which covered the weekly topics in the form of a problem solving, labelling, short notes, fill in the blanks and multiple choice questions, followed by about another hour of discussion. The questions asked were prepared and discussed at the faculty level to ensure adequate depth, attainment of learning objectives, integration for all strands and consistent with the faculty's expectations. A survey was conducted at the end of the fifth week in order to identify the students' perceptions regarding TJE. Information was collected by using a self-completed questionnaire. A total of 26 students (92.9%) returned the completed questionnaire. The results showed that almost all students responded positively to the TJE. More than 90% of the students perceived that the exercise was relevant to the weekly topics, easy to understand, adequate in depth and beneficial. Although the majority of the student (76.9%) felt that the questions asked were not easy most of the time, the result indicated that the students were receptive to the combination of the various assessment methods used and the weekly frequency of these assessments. For those who did not do well, remedial sessions were conducted and attendance was strongly recommended.

Mohd Amin Shariff
The experience of implementing behavioural strand on first batch on the first year medical students of UNIMAs
International Conference on Quality Assessment in Health Professions Education, 26 November - 1 December 1995, Manila Philippines.

During the introductory block of 10 weeks for the first year and the first batch medical students of University Malaysia Sarawak, several topics pertaining to understanding of behaviour aspects of human being were introduced. Triggers were prepared to facilitate problem-based learning and to increase student learning. The initial aim is to make the student more aware of themselves, their own personal functioning, facilitate interpersonal communication and acquire ability to understand and work in group. After 10 weeks the student were asked about their experience concerning the behavioural strand. They were inquired concerning the relevance of the topics, the ability to utilize the knowledge acquired, the practicality of implementing what they themselves formulated during the discussions.

Tan Poh Tin & Christiansen RG
Early clinical skills teaching an integral part of problem based learning?
International Conference on quality assessment in health professions education, 26 November - 1 December 1995, Manila, Philippines.

The traditional dichotomy between "preclinical" and clinical teaching has resulted in clinicians being blamed for the lack of scientific basis in their clinical practice and that of the students they train. The basic clinical scientists were also erred for

failing to show the clinical relevance and applications of scientific knowledge to medical students; hence the poor retention and recall of the basic sciences in clinical years. Problem-based learning uses clinical problems to trigger enquires into the underlying pathophysiology of an ailment. Early hospital and patient contact and clinical instruction is an integral part of the PBL curriculum. Our experience with the first batch of 27 medical students have shown that a half day a week in the hospital can enhance their learning skills of interviewing, history taking and systematic physical examination and case presentation. Their interest in knowing and learning the scientific basis of the ailments encountered also appears to be deeper and broader. Clinical topics are chosen consistent with the theme of the PBL triggers for the week. Teaching is done by faculty and part-time lecturers who are physicians from both the private and public sectors. The faculty members however are entrusted to ensure consistency in the delivery of skills by non-faculty lecturers through close supervision of both theoretical and clinical teachings, continuous assessment and reinforcement of good attitudes and skills by the describe, demonstrate and do approach. Role play is particularly useful in developing interview and history taking skills. Video quizes and exercises are also helpful in ensuring that students observe and record their impressions in a non-threatening manner that can further enhance their observational and descriptive skills. A standard format for history taking and physical examination is strictly adhered to on every personal encounter with a patient. Learning clinical ethics, attitudes and skills is possible and desirable even before the students have mastered the complex medical terminology, concepts or knowledge to apply them.

U Kyaw Tin Hla
Problem based learning over the Internet
ICCE 1997, International Conference on Computers in Education, 2-6 December 1997, Kuching, Sarawak

A simple but novel approach to using Internet as a tool for conducting Problem-Based Learning (PBL) sessions over the Internet is considered. This is the preliminary report to encourage participants to use Internet as a tool for teaching learning process A common problem in the form of a trigger was used. A trigger of a four- year old presenting with fatal myocarditis was put over the net and students discussed the trigger over the net using CUSeeMe and Netmeeting and Email. The prevalent viral infections was EB71/Coxsackie B infection. Students download all available informations from the Internet including clinical pictures and discussed over the Internet using the videoconferencing softwares. The exercise was carried out in an open-ended fashion unlike the usual PBL sessions where the students are required to present their findings at the end of the week.

Hashami Bohari, Mariah Ahmad, Henry R Gudum and Syed Hassan Almashoor
Community health curriculum in an innovative, problem-based and community-oriented program at Universiti Malaysia Sarawak
7th Malaysia/Indonesia Cultured Symposium, Bandung Indonesia. 18-20 December 1997

Development, industrialization and changes in life styles had exposed the Malaysian population to an epidemiologic transition which subsequently shape the new health services needs. Increases in the consumer demand, escalation of health care costs, technology advancement and unresolved old problems of health care maldistribution contribute towards the increasing needs of reviewing the current medical education's curriculum. Consistent with the changes in needs for the new approach in medical education, The Faculty of Medicine and Health Sciences, Universiti Malaysia Sarawak had planned and implemented an innovative five-year medical course. The main characteristics of the medical education offered here are ***i***. the problem-based learning structure, ***ii***. early clinical exposure, ***iii***. the community-oriented approach and ***iv***. The emphasis on active self-directed learning by the student.

The community health curriculum begins on the first week of the program until the final year (year five) of the course. In phase 1 (year 1 and year 2), students are exposed to the problem-based session, laboratory works, community visits and limited number of lectures. Topics covered include principles of epidemiology, statistics, environmental health, demography, medical sociology, group dynamics, communication and health services in Malaysia. In phase 2 (year 3 to year 5) students will be posted to the relevant clinical disciplines. In year 4 the students will be in

the community throughout the year. They will be posted to the community survey posting (10 weeks), district hospitals (25 weeks), primary care posting (5 weeks) and elective posting (5 weeks). In year 3 and year 5, the community health topics are integrated in the clinical teaching. In this posting, the topics covered include clinical epidemiology, occupational medicine, patient education and comprehensive case study. Besides emphasizing on the relevance of the curriculum content and usage of health facilities in the community, the university also appointed the medical and health staff from the government and private hospitals to become adjunct lecturers to teach the students. They are also involved in the examination and continuous assessments of the students progress throughout the programs.

The carefully planned curriculum hopefully will expose the students to a dynamic learning process, at least at the same level with the other medical courses in the country in terms of quality and relevance to their future career. The community-oriented approach will instil appropriate values in the graduates which include their being sensitive to the relevant culture on our multi-racial community and become motivated to provide services anywhere in the country. The self-directed and student-centred learning will equip our students with the desire for life-long learning that is so essential in the medical profession.

Syed Hassan & Hashami Bohari
Personal achievement and increased cholesterol
6th Congress of Asian Federation for Psychiatry and Mental Health and 10th Asean Forum on child and adolescent psychiatry, 4-7 November 1996, Bangkok, Thailand.

The survey was conducted to seek the correlation between personal success achievement and cholesterol level among a group of university academic staff. A group of 49 academic professionals (28 males, 21 females) participated in this university self development programme. A seven-item questionnaire on physical, emotional and cognitive aspects of the individual was used. At the same time, their levels for cholesterol were determined using finger prick method (Reflotron). The study showed there is a strong correlation between personal achievement and cholesterol level. Many studies have shown that highly strung individuals and those with obsessions regarding datelines tend to have a higher risk of coronary disorders. These disorders are closely associated with hypercholesterolemia. In this survey there seems to be a significant correlation between personal achievement and blood cholesterol.

Mohd Amin Shariff, Syed Hassan& Hashami Bohari
Mental health in a rural population in Sarawak
6th congress Asian federation for psychiatry and Mental Health and 10th Asean Forum on Child and Adolescent Psychiatry

Our study aimed at identifying the mental health status of various groups of people in a rural district. Psychological manifestations are some of the manifestations that form the indicator of mental health manifestations in the area. Our samples are adult individuals randomly selected from the district population. Thirty-items General Health Questionnaire (GHQ-30) is used to identify individuals in the area who have significant degree of psychological manifestations. A complete personal data of the samples like age, sex, ethnic groups, marital status, level of education's, income and occupation are gathered. A total of 643 respondents were examined comprising of 336 males and 307 females with an average age of 47.3. A total of 484 individuals obtained a score of 4 or less (232 males; 252 females) and 159 obtained 5 or more (104 males; 55 females). In our initial analysis we scored all the samples and took 5 as the cut off point to indicate a case. We found that the abnormal score is significantly associated with various factors like marriage, sex, education, income and occupation but not significant in factors like age and ethnic groups.

Hashami Bohari, Syed Hassan & Mohd Amin
Mental health status of rural smokers in Kota Samarahan, Sarawak, 1996
6th Congress Asian Federation for Psychiatry and Mental Health and 10th Asean Forum on Child and Adolescent Psychiatry

This study was conducted to compare the mental health status of smokers and non smokers in rural community of Kota Samarahan in 1996. A total of 223 smokers were identified from a community survey conducted and compared with 420 non smokers from the same area. They were interviewed for their social status and smoking behaviour. This mental health status was determined by using a 30

items General Health Questionnaire (GHQ-30). A total score of 2 and above was used to indicated abnormal cases. The majority of the samples were males (52.3%), 40 years old and above (68.1%), worked as farmers (63.6%) and had income less than RM 250 per month (62.8%). The mean mental health score for the smokers was found to be significantly higher than the non-smokers. The abnormal score rate was 31.4% among female smokers and 28.4% for male non- smokers. The abnormal score was also not to be associated with the amount of cigarette smoked per day but not during smoking duration. Smokers tend to have not only established physical illness but also abnormal mental health score. CHQ-30 questionnaire was found to be useful for screening the smokers for a more comprehensive smoking cessation plan.

Hashami Bohari, Syed Hassan & M A Shariff
Perception of health amongst smokers and non smokers: A comparison using the GHQ-30
International Society for Quality of Life Research, 24-27 October, Manila Philippines.

A cross-sectional study was conducted among 246 smokers and 356 non-smokers from Kota Samarahan, Sarawak in order to determine the perception of health amongst smokers and non-smokers in rural communities. The samples were interviewed for their socio-demographic and health aspects by using the pre-test general questionnaires and a validated 30 items-General Health Questionnaire (GHQ-30). Majority of the samples' population were male, aged above 40 years old, working as farmers and from the lower socio-economic groups. the over all prevalence rate of smoking was 58.9% among males and 14.8% among females. The study found that the prevalence of mental health morbidity was 35.4% among smokers and 18.4% among non smokers. perception on own health differ significantly in term of their ethnic groups, gender, smoking behaviour and working status. the result support the use of the GHQ as a screening device to compliment other health measures in epidemiological studies.

Subeh J M & Bowman, M
Rural community mental health programme: A suggested multiagency and community participatory approach
3rd National Mental Health Convention, September, 1997 Kuching, Sarawak

Community mental health programme is often construed as the responsibility within the jurisdiction of the psychiatric-mental health services. This paper suggests and examines the possible development of rural community mental health programme through a multiagency and community participatory approach using the existing human resources and infrastructural facilities in the community such as the use of staff training, coordination with the existing health care systems and community development as critical factors in developing a rural community mental health programme.

Mohd Amin Shariff
The treatment of the sexual abused victim and the family
3rd National Conference on Child Abuse and Neglect, 24-25 June 1995, Kuala Lupmur, Malaysia.

There are lots of studies which showed untold sequaelae in victims of intrafamilial sexual abuse. Psychological intervention and rehabilitation is very important because the effect on them can be life long. Those who are not able to handle this trauma will show various manifestations which will influence the course of their life. Intervention is very important to help sort out their everyday functioning and also to help them overcome the distress in acceptable ways.

Decision on the placement of the victims or the perpetrators are crucial especially after the disclosure and more so the presence of physical evidence. The victims themselves are in very great dilemma and as for other family members various emotional reactions could be seen.For the child victims, individual approaches including individual counseling and psychotherapy are indicated. For the family likewise family counseling and family therapy are important and are commonly instituted. Self help groups are also very important nowadays and in places where there are not many professional therapists this seem to be a choice. Whatever the treatment modalities that is offered the main aim is to help the victims and their families.

Mohd Amin Shariff & Hashami Bohari
Recognising people with psychological problems in the community: How to reach them? A practical suggestion.
3rd Malaysia Mental Health Convention, 5-7 September 1997, Kuching, Sarawak.

A study on the psychiatric morbidity in a rural population and recommended a practicable way to help them is presented. A total of 643 adult respondents from 5 villages were studies using GHQ-30, a translated version. Fromthe survey, 24.7% of those studied indicate that they fall into those group with probable psychiatric morbidity. From the above findings the risk groups we identified are the widowed, those not married, those not working/unemployed group, those with income less than From the, those with minimal education/ did not go to school. Our conclusion is that for a rural community the figure is quite high. We have suggested a measure which is practicable to help deal with this group in the rural community. The front line health personnel or workers are the best people to make use of. But we have to see that they are equipped with adequate knowledge and skills.

Syed Hassan, Abu Bakar Ab. Rahman & Berinoe ak Rojey , Obesity and sleep disorders
3rd Malaysian Mental Health Convention, 5-7 September 1997, Kuching, Sarawak.

Obesity is associated with eating disorders and the obesity itself has been known to be associated with a number of medical disorders, including disorders of sleep. In this presentation, illustration would be made, regarding the association of obesity and sleep disorders. The patients were investigated using polysomnography at the sleep study clinic, Sarawak General Hospital. The results of the sleep history questionnaire, the respiratory disturbances index (RDI) and the severity of sleep apnoea showed marked disturbance in these patients. The sleep research laboratory could provide some insight into these disorders.

Mohd Amin Shariff
Behaviour and conduct disorders in children, Malaysia Perspectives
Fourth International Congress of Tropical Pediatrics, 7-11 July 1996, Kuala Lumpur.

As Malaysia is seeing the economic as well as the social changes it is also observed that the people are more aware of the undesirable as well as the antisocial behaviour of their children brought up and caught in this new era of change. The behavioural problems of children and adolescent are often highlighted in the media whose tendency is finding something to blame.Behavioural problems and conduct disorders which are not brought to the attention of the law are left to the parents and school authorities to intervene. The statistics complied by the school authorities, the social welfare department and the police concerning these problems appear to be the only indicator of the incidence that are officially published. this is certainly not the true figure because there others in the community which are left unattended. research into this area is lacking and should be encouraged. In Malaysia the emphasis on the approach to these problems is usually immediate intervention and the prevention strategies. As they are mostly lumped together as social problems rehabilitation is frequently referred to rather than treatment. In the course of doing this many researchers went about trying to identify the aetiological factors. factors in the environment and the family are much talked about and various proposals are put forward to the government.

Mohd Amin Shariff
Social work perspectives in the rehabilitation of the sexually abused victims in Malaysia.
Southeast Asian Conference on Emerging Trends in Social Work Education : Challenges for the 21st century, 28-30 August 1995, Kuching, Sarawak.

Social problems appear to be one of the side-effects of industrialization and urbanization. Malaysia is now seeing an alarming increase in cases of physical and sexual abuse in children. the cases of sexual abuse are dealt with as vigorous as possible in a multidisciplinary approach with the best possible decision taken to help the child. Rehabilitation is an important aspect of management which require skills and ability to carry out. In children who had been sexually abused especially by their own family members, there are various psychological manifestations and sequaelae to be taken care of. A social worker has to be aware and understand fully these problems.The role of social worker in the rehabilitation is very desirable and challenging. Decisions on the placement of the child and returning to a safe environment require a complete assessment of the social factors, the family and the child victim herself. Supervising, monitoring, following up, prevention and

inculcating awareness are other aspects they have to carry out. The skills of group intervention, family intervention and individual intervention have to be acquired in order be able to go about helping the victims. Above all, the social worker have to be really committed when involved in these activities. The training of a social worker have to take into account the acquiring of the above skills. social work is a very new area in Malaysia and there are not many fully trained people in this discipline. exposure and experience is very important and more so developing a professional and appropriate attitude. It is quite detrimental to be emotional although this issue can easily arouse one's emotion. In rehabilitating the victims of sexual abuse, the social workers have to play a central role compared to other professionals because they are in direct contact with the victims and their families.

Syed Hassan Almashoor & Abu B. Rahman
Daytime sleepiness and health hazards
Asean Ergonomic 97, 5th SEAES Conference

Sleep is a normal physiological process and an adequate number of hours of quality sleep would enable the individual to wake up fresh and ready for productive work. However a significant number of the population seems to be suffering from sleep disorders. insomnia include those who suffer sleeping difficulties when they are supposed to remain awake. The biological and environmental factors could precipitate the onset of insomnia and hypersomnia and these could be explored further in sleep research laboratories. The consequences of these phenomena have led to many tragic losses. A study on sleep disorders is now being done at UNIMAS Sleep Research Laboratory in Sarawak General Hospital and the authors would like to illustrate three such cases. The patients completed the sleep history questionnaires, each of them have their night long polysomnogram done and the assessment of their sleep architecture as well as their respiratory index and apnoea duration were determined. All of them suffered from day time sleepiness, they were distressed by their inability to remain awake and they were prepared to try new intervention health measures to improve their health.

Subeh J M & R Christiansen
A paradigm shift in Malaysian nursing education: interfacing medical and nursing education
International Conference on Quality Assessment in Health Professionals Education, 26 November - 1 December, Manila, Philippines

Nursing has undergone significant changes and faced many challenges in its quest for professional autonomy and recognition. One of the most challenging forces is that nursing services in Malaysia has been classified as a supportive service under the New Remuneration Scheme which was introduced in the country in 1992. Under the present system of nursing education which is at the diploma level and takes place outside the university, it may even be more difficult for nursing in Malaysia to attain professional status. With the establishment of a new medical school at University Malaysia Sarawak (UNIMAS), an opportunity has arised for the development of an innovative paradigm shift in nursing education. This paper presents a proposal for a new nursing curriculum at the bachelor's level using an approach that interfaces medical with nursing education. Concepts which are broad in scope and applicable to nursing and medicine will be identified and studied together by students of both disciplines. This approach will allow the use of shared available resources which may prove cost effective in the university's endeavor to be efficient. It is hope that the new curriculum will teach professional nurses and medical practitioners to collaborate and complement each other's role in the delivery of cost effective and quality care through their common educational preparation in relevant areas. One of the major areas that could be interfaced significantly is the assessment of clinical skills, which could improve quality assessment and assurance within medical school education. The poster presentation will present a model of the new nursing curriculum and areas that could be interfaced between the two disciplines are identified and highlighted.

Subeh J M
A theoretical evaluation of the suitability of the denver developmental screening test for used by public health nurses in Malaysia.
2nd National Community Health Colloquium, Universiti Kebangsaan Malaysia, October 1995

One of the popular developmental screening instruments in current use is the Denver Developmental Screening Test (DDST). Since its development by Frankenburg and Dodds in 1967, it has become one of the most extensively used developmental screening instruments in the United states and other parts of the world. It has been standardised for used in countries such as the United Kingdom, Israel, Philippines, and Japan. This paper presents a theoretical evaluation of the appropriateness of the DDST for use by public health nurses in Malaysia. The DDST is analysed critically in terms of what is known about its effectiveness and its practicality for use in Malaysia. While the results of the analysis suggests that the DDST has the potential to be an effective, appropriate and practical instrument for developmental screening of pre-school children in Malaysia, however, formal conclusions about the test's validity and reliability for use in Malaysia cannot be finalised until the test is standardised by empirical testing.

B. PUBLICATIONS

Chang Moh Seng
Study on the usage of bednets in four rural villages in Lundu District, Sarawak .
Vector Journal, 1995 : 2 (1): 27-30

Bednets are commonly available and used by the rural population though the number owned per family is relatively low with an average of only 2.3 nets. Although the regular users were significantly higher than non-users, the percentage was comparatively low with only 64.1% of the population regularly using bednets. The main reason for using bednets was protection from mosquito bites as cited by 85.5% of the respondents. The use of bednets is seen as more beneficial to the children where 82.6% went to bed before 2100 hours against only 19% of adults. Implementation of community based impregnated bednets will have to consider the relatively low number of nets and low percentage of regular users.

Chang Moh Seng, P. Doraisingam, S Hardin & N. Nagum
Malaria and filariasis transmission in a village/ forest setting in Baram District, Sarawak, Malaysia .
J. Trop. Med. Hyg. 1995: 98, 192-198.

Entomological investigations on malaria and bancroftian filariasis transmission were carried out in the endemic area of Baram District, Sarawak. The *Anopheles* composition, survival and infection rates of malaria and filariasis were compared in the village and in another ecotype, the forested areas 0.5 km from the village. *Anopheles leucosphyrus*, *An. barbirostris* and *An. donaldi* are the vectors for malaria and bancroftian filariasis in both ecotypes. Biting and infection rates vary, but *An. leucosphyrus* differed with a peak activity around midnight in the forest areas and soon after dusk in the village setting. The apparous rate of *An. leucosphyrus* was significantly higher in the forest ecotype ($p< 0.0001$). However, the proportion of 3-parous and older was not overall higher in the forest ecotype ($p=0.68$). The entomological inoculation of malaria parasites by *An. leucosphyrus* was comparatively higher in the forested areas ($p>0.5$).

Chang M S & N. Jute
Community participation on permethrin-impregnated bednets for malaria control in Lundu.
Malaysian Medical Association 1995, 59 - 61.

A community-wide evaluation on the effectiveness of permethrin-impregnated bednets in four villages at Lundu were carried out. Epidemological assessment on malaria prevalence was done at 6-monthly interval for two consecutive years. No significant reduction of malaria incidence following the community usage of treated nets was observed. The opening up of new plantation near the study villages contributed to the persistent transmission of the disease. Entomological inoculation rate (EIR) assessment on *Anopheles* vectors indicates a significant impact on indoor population. A similar impact was however not observed for out-door population.

Chang M S, J Hii, P. Buttner & F. Mansoor
Changes in abundance and behaviour of vector mosquitoes induced by land use during the development of an oil palm plantation in Sarawak.
Trans. Royal Society of Tropical Medicine and Hygiene (1997) 91: 382-386.

Surveys were conducted of adult and immature mosquitoes in an area undergoing oil palm development in north Sarawak. Point prevalence data from two sites were collected annually, coinciding with annual phases of forest clearing, burning/cultivation and maintenance. Major habitat perturbation during the forest/clearing transition shifted the major mosquito faunal equilibrium in terms of species composition, relative density and occurrence. Analyses of variance showed that the mean numbers of four species of *Anopheles* decreased significantly after forest clearing. Relative densities of immature stages decreased after forest clearing, but *A. letifer* and *Culex tritaeniorhynchus* remained relatively unchanged after the second year. Comparisons with the pre-development forest stage showed that the reductions in person-biting rates, adult survival and combined entomological inoculation rates (EIR) of *An. donaldi* and *An. letifer* decreased the risk of malaria transmission by 90% over the four-year period. Concomitant reductions in EIR and annual malaria incidence were also correlated with forest clearance period. This study highlighted the "law of unintended consequences", since two opposing effects were observed: reduction of malaria vectors but concomitant increase of dengue vectors.

Lee HL and Chang MS
A model of dengue transmission: determination of the thredhold of transmission using ovitrap surveillance data in Sarawak, Malaysia.
International Medical Research Journal (1997) 1(1): 55-59.

Weekly ovitrap surveillance of *Aedes* vectors was conducted continuously in three urban areas in Kuching Sarawak to monitor their populations. The possible application of sequential sampling technique to analyse the ovitrap data was examined. The *Aedes* eggs/larvae were found to exhibit a clumped distribution fitted to a negative binormal distribution model without a common K value. The sample size of ovitraps required for decision to control *Aedes* vectors was determined using techniques of sequential sampling and its use in dengue vector control in Malaysia was examined.

Chang Moh Seng, Fam Khoon Sen & Nagum Jute
Distribution and prevalence of mosquito larvae in Bario highlands, Sarawak.
In:*A scientific Journey Through Borneo: Bario - The Kelabit Highlands of Sarawak (1998) 247-260.*

Mosquito larval survey conducted in the ricefields, transient ground pools, ponds, pitcher plants, tree holes, leaf axils and artificial containers in Bario Highlands yielded 31 species. Of the species, six were disease vectors. *Culex tritaeniorhynchus* and *Cx. pseudovishnui* were the dominant species in the ricefield ecotype while *An. balabacensis* in the transient ground pools. In the plant-water related habitats, the dominant species were *Trepteroides aranoides*, *T. affinis*, *Toxorhynchities splendens* and *Topomyia decorabilis*. *Cx tritaenorhynchus* and *Cx pseudovishnui* preferred to breed in the harvested ricefields whereas *Cx. gelidus* in the planted paddy field. *An. balabacensis* was persistently found breeding in the transient ground pools at the forest edges; thus were negatively associated with the *Culex species*. Pitcher plants formed the most important habitat for 8 species of mosquito larvae. The larval density of *Trepteroides* in relation to the presence and absence of *Toxorhynchities* in the pitchers were investigated. There was no significant predatory effect of the *Toxorhynchities* on both the density and larval growth of *Trepteroides*.

Nor Aza Ahmad, Tan PT, Eugene P K H & Paul Prociv
Distribution of intestinal parasites in a community of Kelabit schoolchildren.
In:*A scientific Journey Through Borneo: Bario - The Kelabit Highlands of Sarawak (1998) 261 - 266*

A survey of parasite distributions in Kelabit Highlands community of Bario was carried out during the scientific journey through Bario. The most common parasite were *Entamoeba histolytica* (34.5%), *Entamoeba coli* (34.5%), *Trichuris trichura* (17.3%), *Ascaris lumbricoides* (15.8%), *Giardia lamblia* (14.4%), hookworms (13.7%) and *Enterobius vermicularis* (6.5%) found in 60.7% of the students. Multiple infections with two to three different

species of parasites were common (69.8%). No parasites were found in 90(39.3%) of the students. The average of haemoglobin level is 12.9 in primary students and 13.1 in secondary students.

Syed Hassan Almashoor & Sharifah Hapsah Shahabudin
Introducing Newwork Members
Newwork of Community-oriented Educational Institutions for Health Sciences : No. 25, 1995 June, 11-12.

The emphasis in UNIMAS overall educational philosophy is quality. Its academic curriculum is comprehensive and is geared towards enhancing total development of an individual and preparing the students to be competent, autonomous and yet able to contribute to teamwork. The mission of each Faculty here is to become a learning centre that is outstanding and preferred among students and society and with the competitive edge to meet the challenges of change. Its medical curriculum emphasises on problem-based learning, community-orientation and early clinical exposure to ensure the medical graduates would be able to respond optimally to the health and medical needs of the people. The five-year medical programme is divided into two phases.

Syed Hassan Almashoor & R Christiansen
A new medical school in a changing world: University Malaysia Sarawak
WHO- Changing Medical Education and Medical Practice: No. 8, December 1995 11-12.

Medical education is changing all over the world and the changes generated by new knowledge and technology are only part of the picture. Expectations for competent primary care providers, low-cost universal care of ill and prevention of disease in the healthy are now being translated into goals for most medical school. The question is, how can a new school arrange its curriculum to prepare medical students to adjust to the changes? Answering that question is the mission of the new medical school at the University Malaysia Sarawak (UNIMAS).

P T Tan & R G Christiansen
Early clinical exposure for medical students in Sarawak
Education for Health 10: No. 1, 1997, 47-56

This paper presents a rationale and curriculum for learning experiences in the clinical setting throughout an undergraduate medical course. At the time of writing only the first year of the curriculum has been completed, and this is described in details. An anonymously completed questionnaire, filled in at the end of both the 10th and the 30th week, elicited the 1st-year students' perceptions of their clinical experiences. The students' enjoyment of this part of the course increased as the year progressed. More students felt comfortable in the clinical setting by the end of the third block. There was also good evidence that the experience helped the students in their studies. However, it remains to be established whether a genuine interest in medicine, as indicated by discussions of patients among the students, would increase as the course progressed. The authors identified a number of questions that remain to be researched. These relate to the criteria for selection and progression, and whether these should favour those students who succeed in written tests or those who demonstrate excellence in clinical skills.

Clarence Lei, C L Teh & A Khairullah
Bladder outflow obstruction masquerading as pelviureteric junction (PUJ) obstruction.
Med J Malaysia Vol 51 (1) March 1996 p 156-158.

Patients with bladder outflow obstruction commonly present with obstructive symptoms suuch as hesitancy and poor stream. In this case the patient developed upper tract symptoms associated with renal impairment. Due to the tendency to develop upper tract dilatation, the dilated renal pelvis might be mistakenly construed as pelviureteric junction obstruction.

THE FACULTY OF INFORMATION TECHNOLOGY

INTRODUCTION

The Faculty of Information Technology (FIT) was established in December 1993. Since then the Faculty has established a number of research and development (R&D) programmes to reflect the growing need for an integrated approach to many information technology problems. The three main research programmes are in the areas of hypermedia systems, knowledge discovery systems, digital image processing and computational science.

The Faculty is committed to provide quality research and development programmes in areas of great importance to the advancement of the field and also to support the growing needs for developing indigenous technologies in this area. And thus the role of the Faculty is to contribute towards defining and advancing the future profile of the nation in a period of global competition and increasing dependence on information technology.

With a mission for innovation, the Faculty is committed not just in the advancement of knowledge in the discipline but also towards the myriad of exciting and challenging research and development activities in area of great importance to the nation in line with the requirements for the establishment of the Multimedia Super Corridor, or popularly known as the MSC.

To further its aim in producing high standard research and development services, the Faculty has invested in the provision of excellent computing and laboratory facilities. The Faculty has a very extensive and wide range of personal computers, workstations, servers, state-of-the-art software packages and networking facilities. The Spatial Analysis Laboratory is equipped with geographical information system (GIS) and remote sensing hardware and software to support the activities of the digital image processing research group. The Faculty was also instrumental in the planning and setting up of the campus-wide computing infrasturucture including the establishment of a fibre-optic data communication backbone and the connection to the Internet.

The Faculty has established active linkages with oversea universities and local industries. In the area of hypermedia systems the Faculty is working closely with the Institute of Information Processing and Computer New Media (IICM) at the Technical University of Graz (TUG), Austria. At the same time the Faculty members are actively involved in the activities of the Hyper-G Consortium, an international consortium of research institutions devoted to the advancement of hypermedia technology and systems.

The Faculty has established a very long and active relationship with the University of Waikato, New Zealand. As far as research programme is concerned, the colaboration is concentrated in the area of knowledge discovery systems and machine learning.The Faculty is also working closely with the industries in collaborative applied and development research programmes. Together with the Forestry Department of Sarawak, the Faculty has contributed in the FOMISS project and jointly organized a workshop on GIS and remote sensing. In addition, collaboration with Telekom Malaysia has been very successful, especially in the research area of formal methods in software development.

RESEARCH PROGRAMMES

Hypermedia Systems

Systems that organize large volumes of multimedia resources have grown in sophistication. They provide for the efficient and flexible search and retrieval as well as facilitate the interpretation and visualisation of data, and allow for the arbitrary composition and authoring for structured or free-form interaction. Research in large, networked hypermedia systems look into issues that range from data models, information navigation and filtering, to user interfaces including cultural diversity factors. The system should be designed to handle not only megabytes of data by mega-quantities of documents that are stored in a distributed fashion

in a network of potentially thousands of computers.

Current efforts are in the research and development of Virtual Campus demonstrator project to address the issues of technology-enhanced education for the 21st. century. The use of technology can facilitate the creation, maintenance and rapid distribution of learning resources, extending the institution beyond the bounds of a physical campus. Education can then be on-demand, flexible and extensively networked socially. Hypermedia infrastructure for teaching-learning, including support for distance learning is to play an important role in the Virual Campus project. Issues addressed include the organisation and management of teaching-learning resources, collaborative authoring, and student management.

Besides the Virtual Campus project as the main focus of this research programmes, there are other projects that have been carried out to support the different aspects of the hypermedia systems. Such projects include studies on the "Cultural Diversity and User Interfaces", "Survey on Cooperative IT Education and Research Programmes with Malaysian Industries" and "Home Page Development".

Knowledge Discovery Systems

Large databases are commonly found in many organizations today. To make sense out of these databases can be extremely impractical owing to the massive amount of data one needs to deal with. This research project is aimed at automating the task of knowledge discovery in databases. The process of discovery will be performed using supervised and unsupervised Machine Learning scheme.

Image Processing Systems

Digital image processing is in general complex and involves operations that are usually computationally intensive. It offers, therefore, great scope for the application of knowledge-based techniques and parallel processing. Our goal is to build an open image processing workbench (like VISTA) that integrates the latest results in image processing techniques, artificial intelligence and parallel processing to support 2D recognition tasks.

The initial work on image processing has been applied to the interpretation of satellite and other remote-sensed data as part of our effort in setting up a comprehensive geographical information system (GIS) for East Malaysia. The identification and acquisition of satellite images are done in collaboration with MACRES who are also interested in the same research work carried out at the Faculty. Research is aimed at advancing pattern recognition technology and its application in identifying objects from the images.

The image processing research is also targeted at applications of a content-based image retrieval system, a relatively new field promising better organization and retrieval of pictorial information. The group is also looking into the application of image processing in telemedicine. This research work is carried out in collaboration with other faculties including the Faculty of Medicine and Health Science and the Faculty of Engineering.

Computational Science

Computational science is a field that combines the computer science concepts and mathematical techniques such as modelling, numerical computation, data visualization and simulation to solve problems in various disciplines, especially in science and technology. It is well-known that systems of linear and non-linear partial differential equations arise in the mathematical modelling of many phenomena in science, engineering and medicine. The objective of this project is to develop efficient and accurate parallel algorithms as a solution of such equations and problems.

A. PUBLICATIONS

Sunil Vadera and Farid Meziane
Tools for Producing Formal Specifications: A View of Current Architectures and Future Directions
Annals of Software Engineering, Volume 3, 1997, pp. 273-290.

During the last decade, one important requirement in the field of engineering has been the adoption of formal specification languages. They offer a well-defined notation that can improve consistency and avoid ambiguity in specifications. However, the process of obtaining formal specifications that are consistent with the requirements is itself a difficult activity. Hence, various researchers are developing systems that aid the transition from informal to formal specifications. The kind of problems tackled and the contributions made by these proposed systems are very diverse. This paper brings these studies together to provide a vision for future architectures that aim to aid the transition from informal to formal specifications. The new architecture, which is based on the strengths of existing studies, tackles a number of key issues in requirements engineering such as identifying ambiguities, incompleteness, and reusability. The paper concludes with a discussion of the research problems that need to be addressed in order to realise the proposed architecture.

Farid Meziane and Sunil Vadera
Towards Automatic Modeling of Requirements
Malaysian Journal of Computer Science,
Volume 9, Number 2, pp 1-13, December 1996

The first phases of the FORSEN system that helps the analyst to use an informal specification as the basis of producing a formal specification and concerns the modelisation of the requirements into entity relationship models (ERM) is described. The modelisation is done from the logical form expressions obtained from the analysis of the natural language text. The ERM models are then used as a basis for the production of formal specification in the Vienna Development Method (VDM).

B. CONFERENCES

Farid Meziane and Narayanan Kulathuramaiyer
Technology-Based Approach for Managing Large Classes: A Case Study
Proceeding of the International Conference on Computers in Education, (ICCE97), December 1997, 563-572, Universiti Malaysia Sarawak

Educational institutions are faced with many problems. In one hand they face a shortage of staff and funding and at the same time the number of students enrolled is ever increasing. The lecturers are faced with large and sometimes huge classes. Providing a quality course using traditional methods of teaching- learning becomes very difficult if not impossible. This calls for a shift in the teaching-learning paradigm whereby the traditional modes become inadequate to both deal with the large number of students and to provide an interactive learning environment. Technology-based and student-centred approaches need to be employed to overcome the space-time barriers in this new environment. In this paper we present our experience in conducting the TMX2012, "IT Tools for Knowledge Workers" course, which had 670 students enrolled. We describe the various aspects of course management such as the laboratory and tutorial booking system, access to course material, modes of communication and interaction with students, administration of assessments and the monitoring of student progress. We also describe how Information Technology has been used extensively throughout the course.

Farid Meziane and Sunil Vadera
Invariant Definition for Formal Data Types
Proceedings of the National Conference on Research and Development in Computer Science and its Applications (REDECS'96) , 64-68, June 1996, Universiti Pertanian Malaysia

The use of formal methods in software specification and design is acknowledged as an important tool for the development and verification of software systems. With a formal specification we can verify systems in a systematic manner. The advantages of the use of formal methods are enormous. However they are still not widely used. One of the main reasons for the poor use of formal methods is their mathematically based notation. In fact, some analysts find them difficult to use and comprehend. Some authors have attempted to bridge the gap

between the informal or semi formal notations and formal methods. Some of this research is based on the development of tools that aid the production of formal specifications from informal ones. Among this research is the FORSEN system developed by the authors. FORSEN attempts to analyse informal (English) requirements and produce VDM specifications and data types. The data types defined have usually associated invariants, which are very important for the specification of operations. The issue raised in this paper is how to introduce invariants in such systems? The approach experimented in FORSEN is to introduce the invariant as an English sentence and than translate it to a VDM expression.

Abdelhamid Abdesselam
Content-based Image Retrieval Systems: State-of-the-art
National Conference on Research and Development in Computer Science and its Applications
REDECS '96 Universiti Pertanian Malaysia, June 26-27, 1996

Images as a storage media is today as widespread as text; actually, every day a large amount of documents combining images and text are digitised and stored for future access, tens of thousands of terabytes are sent by diverse satellites to the ground stations where they are archived, and thousands of images are added to the largest database never seen in human history (Internet). Digitising documents, receiving satellite images and having access to Internet do not imply getting the right image in an acceptable time. Therefore, accessing the relevant image based on its contents is a very crucial problem that has to be solved. This problem attracted the attention of researchers across several disciplines, and some Content Based Image Retrieval (CBIR) systems have already been proposed. This paper is intended to address the main CBIR issues and to present the current research development in the area. Query-Specification Interface, Data Modelling, Multimedia Integration and Feature-Extraction and Similarity Measure Algorithms are some of the main issues addressed in this paper.

Md. Mijanur Rahman, Abdelhamid Abdesselam
Knowledge-based Approach For Automatic Extraction of Road Network From Satellite Imagery
The 18th Asian Conference On Remote Sensing, 20-24 October 1997, Kuala Lumpur

Recent and accurate topographic information is essential for many operations like military planning, map production, transportation planning, urban growth survey etc. Road networks, being one of the most important topographic features, worth be extracted from satellite imagery, a powerful source of topographic information. This problem has been addressed by several researchers. Some of them have adopted an artificial neural network approach in supervised mode, while some others a dynamic programming or a graph approach in interactive mode. A few automatic knowledge-based systems for detection of road networks are also available. The systems developed so far are mostly limited to restricted areas and extracted road networks are not complete and sufficiently accurate. We propose a knowledge-based system that operates in three main steps: ***1***. Extraction of candidate road pixels, ***2***. Construction of road segments and ***3***. Building road network. This system has the advantage to be automatic and to take into account the expert knowledge related to the road network.

Narayanan K, Kum Hon Yew and Zahran Halim
Machine Learning Approach to Email Filtering
REDECS 96, UPM, June 1996

This paper describes an approach to automatically discover implicit classification rules used to organise Electronic Mail (Email) folders. These rules can then be used to automatically organise/classify new incoming mails. Users' feedback on the suggested classifications are used to improve the system behaviour in future (through rule modification). In particular, users' actions on incoming mails (delete mail, save mail to folders, etc.) become primary inputs or prompters that the system uses to adapt its rules and future behaviour. Feature extraction techniques from Information Filtering are used to construct a set of vectors or training examples from existing folders of email documents saved by a user. Using these vectors, supervised machine learning schemes are used to discover the best set of rules that "fits" a document collection. These rules, in some sense, explain the (implicit) criteria that a user must have (notionally)

used in organising his/her documents. The feature extraction program strips off unnecessary details from the raw email messages and converts them into the Attribute Relation File Format (ARFF). The ARFF text files contains positive and negative examples used as inputs to a supervised machine learning program. The Waikato Environment for Knowledge Analysis (WEKA) workbench, which provides a number of learning schemes, is used for the machine learning experiments. Results of selected schemes are presented and discussed. Further to this, we address the issues of rule adaptation to account for new or changed knowledge. A generalised architecture of a computer-assisted document organising and retrieval system is then presented, putting into context the important components of initial rule discovery, user interaction interfaces and adaptive behaviour.

Narayanan K.
Virtual Reality in Education
Virtual Reality Seminar and Workshop VR'98, Kuala Lumpur 14-15 April 1998

Virtual reality is proving to be a valuable medium for education and training purposes. The student is able to explore a variety of interactive worlds. This approach facilitates learning through discovery rather than presentation and as such embodies all the benefits of experimental learning, whilst it can support and supplement more traditional classroom practices.

Narayanan K.
Managing Teaching-Learning in the Virtual Campus
Tele-education for the Next Era, Tele-Ed Asia '97, Kuala Lumpur Malaysia 16-17 September 1997

Virtual Campuses are faced with the challenge of providing quality education to a large number of students distributed over a wide area. Technology-based and student-centred approaches need to be employed to overcome the space-time barriers in this new virtual environment. This presentation describes the experiences gained in managing tele-learning classes at University Malaysia Sarawak(UNIMAS). The role of IT in addressing the various aspects of tele-learning course management such as course registration, access to course material, interaction with students, administering of assessments and the monitoring of student progress will be discussed.

Roger W. Harris
Do Students and Lecturers feel the same about Computers?
The International Conference on Computers in Education, Hilton Hotel, Kuching, Sarawak, Malaysia, December 2-6 1997.
Award for Outstanding Paper.

Full integration of Information Technology (IT) into teaching and learning at universities requires high levels of involvement with the technology and greater commitment to making effective use of it from teaching staff as well as from their students. As lecturers progress from the use of IT for routine productivity gains to its introduction into core teaching activities, their students have to adjust to new modes of learning. In order to be successful, both lecturers and students should adapt their teaching and learning approaches to the use of IT in harmony with each other, otherwise the new methods which IT imply may fall short of their expectations. This study examined some of the attitudes which university lecturers and students in the same institution have towards computers. The results suggest that students are both more involved with and more anxious about computers than are their lecturers. As academic staff develop IT for instructional uses, they should not confuse their students' apparent enthusiasm for computers with a willingness to adopt IT as a learning tool. To use IT successfully in teaching and learning, an institution depends on the willingness of staff to adopt such measures as well as on their ability to win over their students to use them.

R. Harris, R. Davison, D. Splettstoesser, A. Wong, and A. Yeo
Ethnic Dimensions of Attitudes Towards Computers in Developing Societies: Computer Anxiety and PC Involvement
Proceedings, 31st Hawaii International Conference on System Sciences January 6-9, 1998, Kona, Hawaii, vol. 6, 695-704, pub. IEEE Computer Society.

Information systems (IS) are implemented within a social context consisting of economic, political, cultural and behavioural factors which differ greatly between societies and countries. Failure to take account of such differences can inhibit adoption of information technology (IT) and increase the risks of failure for system implementations. Developing societies are particularly vulnerable to such risk as their social contexts exhibit considerable differences,

not only from the developed nations but also among themselves. This study examined the computer anxiety and involvement with Personal Computers (PCs) of six groups of computer-using students from China, Hong Kong, Malaysia, New Zealand, Tanzania and Thailand. Differences were found to exist between the computer anxiety of some of the groups which were probably attributable to demographic factors. Differences were found to exist between the PC involvement of some of the groups which could be attributed to ethnic factors. Implications for research and practice are drawn.

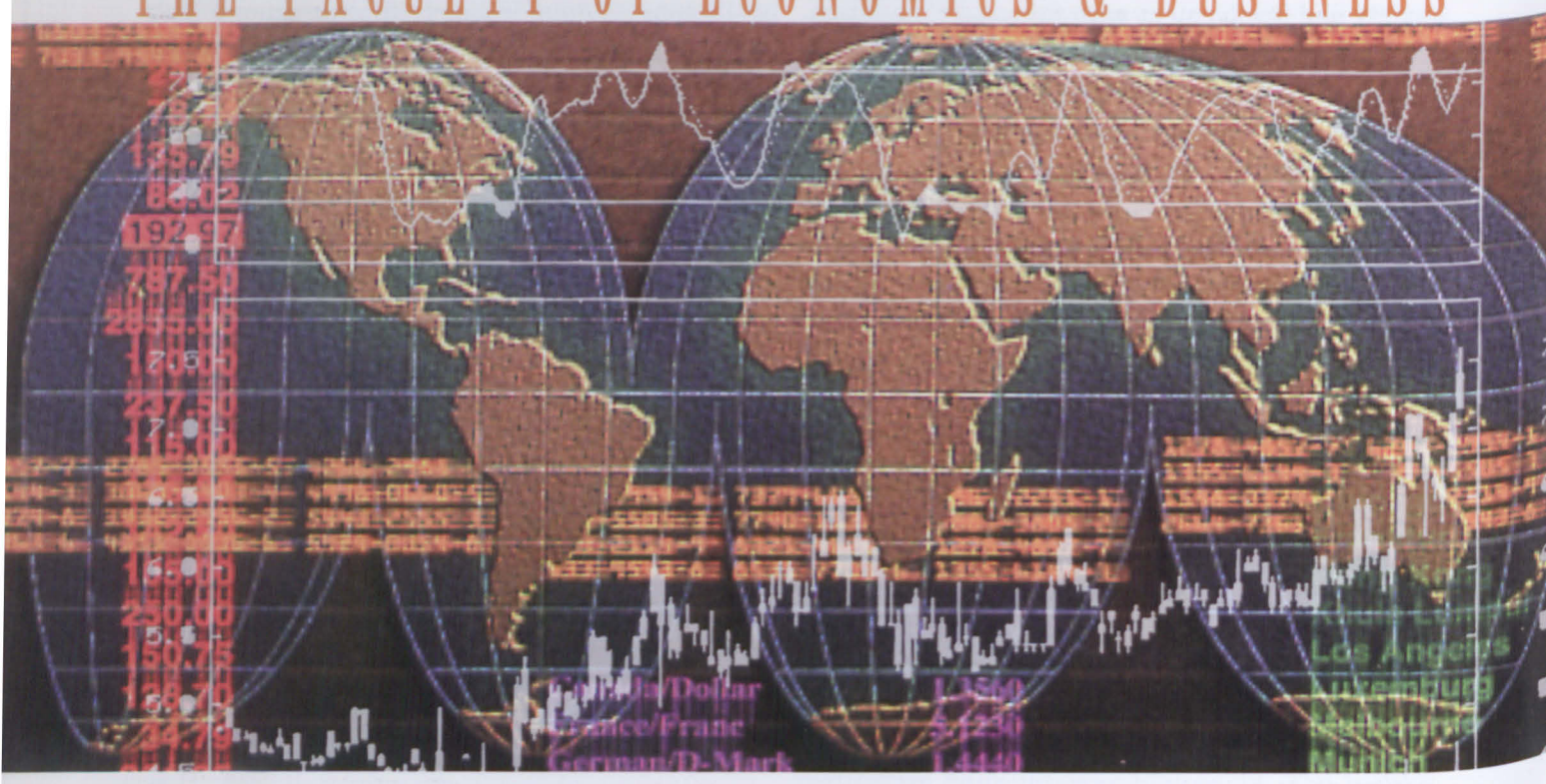
Roger W. Harris
Attitudes Towards Computers among Hong Kong's Accountants
BIT World - Business Information Technology Management: 25 -27 February, 51-71, 1998, The Taj Mahal Hotel, New Delhi, India.

Organisational success with personal computers (PCs) is largely dependent upon voluntary adoption behaviour by individuals, which is regulated by their attitudes. Even where proven opportunities exist for the beneficial deployment of PCs, adverse attitudes can inhibit their use. Structural equation modeling was used to analyse survey data relating to the processes by which Hong Kong's accountants form their attitudes towards computers. The results support hypothesised influences on attitudes from personality, product involvement, task characteristics and demographic variables. Mechanisms for promoting involvement and positive attitudes towards computers are critical for alleviating negativity and for full appreciation of the benefits of PC use.

Narayanan K.
UNIMAS Learning Culture
Handbook of Teaching Learning, August 1996

None of the accepted measures of corporate performance can be shown to bear any meaningful relationship with the amount of money which a corporation spends on its Information Technology (IT). In order to avoid being seduced by IT and turning our fascination with it into an expensive cult, it is necessary to dispel the popular myth that spending more on IT will automatically, of itself, boost economic performance. The majority of IS professionals hold to the traditional perspective of IT, that technology itself is the cause of change. Such a view stands in the way of positive organisational change by promoting technical interests over business concerns and is rapidly becoming unviable for IS departments, whose credibility among their user-clients continues to diminish. National development will not occur and scarce resources will be squandered if society's ability to change the methods by which it achieves its goals is not matched to the fervour with which it embraces information technology.

THE FACULTY OF ECONOMICS & BUSINESS



INTRODUCTION

Faculty of Economics and Business (FEB) officially began operations on 18 December 1995. The location of UNIMAS and FEB in particular has made it possible for us to undertake applied economic studies relating to Sarawak as well as other parts of Borneo. This has been demonstrated by our involvement in the ***Technical Manpower Study*** initiated by Yayasan Sarawak . The conclusion derived from this study will be helpful to design manpower policies relating to Sarawak.

RESEARCH PROGRAMMES

The Teaching and Research that is undertaken in FEB is split up into four niche areas viz. **(1)** Economics **(2)** Business **(3)** Tourism and **(4)** Management Information System.

A. CONFERENCE AND SEMINAR PRESENTATIONS

M.G. Kanbur
An Empirical Analysis of the Performance of Licensed Finance Companies in Malaysia, December 1996

In considering the importance of economic development of any country, a well organized and fully developed financial system in necessary, while of course not overlooking such aspects as technology, productivity, entrepreneurship, proper education and training programme, human and capital resources and finally, economic and political stability. A fully developed financial system consists of a wide range of institutions, instruments and markets which are mostly features of developed countries. The financial system of any economy (developed or less developed) serves to allocate resources from surplus units such as individuals and households to deficit units like business firms and government. The process of resources allocation involves borrowing-lending mechanism which ensures a stable and efficient working of financial system as well as the economy of the country.

The financial system of Malaysia as in most developing countries has developed through four

stages viz. (*i*) a commodity money stage, (*ii*) a primary debt stage, (*iii*) a financial intermediary stage, and (*iv*) a maturity stage. Thus there are two parts in the financial system in Malaysia. They are the banking system and the system of non-bank financial intermediaries.

The Malaysian financial sector has experiences a tremendous growth throughout 1970 to 1990. In meeting the continued needs of growing Malaysian economy, the expansion of existing institutions and emergence of new financial institutions is inevitable to take place. In view of this, it is worthwhile and imperative to examine the performance of Malaysian financial institutions.This paper presents an empirical investigation of the performance of licensed finance companies of Malaysia. The paper contribute to the literature in two ways. First, it is one of the few studies that has been conducted on licensed finance companies of Malaysia. Second, the paper demonstrates a useful worthy attempt to draw upon available contributions to the bank performance for building structure performance model of Malaysian finance industry. However, based in the simultaneous nature of the framework, a simultaneous equation model is specified and estimated using quarterly time series data. Our estimated empirical results show that market structure determined the performance of finance companies. Other results show that the success of companies' performance depended in their risk management and staff productivity. The correct pricing strategies are expected to minimize overall risk of the industry.

M.G. Kanbur
Commercial Banking Of Malaysia: Performance and Issues, December 1997

The issues of financing economics development have attracted attention of many researchers over many years. In particular, the subject concerning the relationship between financial development and economics development gain much prominence during 1960s and 1970s. Mention may be made in this connection of studies by Gurley and Shaw (1955, 1960,1967), Goldsmith(1969), Mckinnon (1973), Bhatia and Khatkhate(1975) and Galbis (1977). It is argued that as financial system influences economics development, it is in turn stimulated by economics growth. Thus the dynamics system of the financial sector of the development country could imply the effect of growing economics development.

Malaysia is a typical instance amongst developing countries where financing development activities are geared towards continued need of the economy. The Malaysian financial sector has experienced an increased growth throughout two decades (1970-1990). In meeting the continued need of local developing economy, the expansion institutions and the emerge of the new financial institution and instruments have taken places.

Finance companies in Malaysia which formed part of the financial institutions started functioning in early 1960s and expanded their operations substantially to become the second largest group of deposit taking financial institutions after the commercial banks. More than 80 percent of the deposits with the financial companies have been in the form of fixed deposits of varying maturities. Beside, it is expected of the finance companies to play some intermediate significant roles in enhancing the pace of economic development. Thus the enormous growth over the past two decades has put the finance companies in a vulnerable position in the overall financial system of Malaysia. However, the relatively little empirical research concerning performance of financial companies and that of commercial banking of Malaysia is surprising given the economic influence which these vital institutions have on the economy.

An empirical study on the performance of financial companies was made by Kanbur (1996) and a paper on it was presented at the Winter meeting of South and Southeast Asian Chapter of World Econometric Society in December 1996 in Delhi (India). From 1980 to 1995, the number of commercial banks which included foreign banks has more than doubled. While the number of foreign banks has remained almost stable the number of domestic banks during this period has inversed more than two and half times. The growth of commercial banks in Malaysia from 1980 to 1995 has made it timely, and worthwhile to undertake the empirical analysis of performance of commercial banking structure in Malaysia.

The purpose of this paper is to examine the performance behaviour and test the applicability of the structure-performance model to the Malaysian commercial banks. In view of the growing importance of commercial banking in the Malaysian economy,

we have confined in this study to the performance of commercial banks. The paper is organized as follows: ***i***. The analytical framework which attempts to explore variates to measure the performance of Malaysian commercial banking; ***ii***. The measure of performance; ***iii***. The estimate of simultaneous equation model using two stage least squares (2SLS) procedure and ***iv***. The estimated empirical results.

Salbiah Edman
The Demand for Fish Among Malay Households in Sarawak, November 1997

The objective of this study is to obtain a brief picture of consumers behaviour towards consumption and expenditure of fish amongst the Malay community of Sarawak. It is also aimed at determining the socio-economic factors that influenced the consumption and expenditure of fish. The variables that influenced the consumption of fish are income, family size, taste and preference and average price of fish, while factors affecting the expenditure on fish are income and family size. The study showed that the consumer preference towards fish is very high (100%) compared with meat. Chicken is the second most preferable meat (98.68%) after fish, followed by beef (81.5%) and mutton (14.47%).

M.G. Kanbur, Rujhan Mustafa, Mahani B.M.A. Shakur
Movement of International Reserves under Monetary Disequilibrium,

The primary function of international reserves is to ensure that the country is economically healthy enough to meet all payments to non-residents arising from international transaction. It serves as a buffer stock which finance temporary discrepancies between a country's international payment and receipts. Therefore the benefit from holding reserves stands from the ability to avoid a reduction in output in case of a deficit imbalance of payment. The consequence of running out of reserves are looked upon as a constraint on economic policy forcing the economies to adjust immediately to external disequilibrium through expenditure cuts thereby increasing real internal disturbances. Furthermore, to a borrowing country perpetual depletion of resources affects the improving capacity resulting in a higher cost than to a country with a stable balance of payments. A sudden drain on the national reserves may jeopardize creditors confidence in the borrowing capacity as well as the borrowing country's ability to service its debt. Without some knowledge of the national demand for reserves and also the public's excess demand of money, the formulation of supply policy for international reserves creation will be difficult.

The purpose of this paper is to build a model that integrates the demand for national reserves with a monetary disequilibrium so that the movement in national reserve is explained. The model first focuses on the determination of country's international reserve relating to Malaysian economy which is currently undergoing monetary disequilibrium. The tentative model that is stipulated is as under:

$$(Rt - Rt\text{-}1) = \beta(R^*t - Rt\text{-}1) + m\,(M^*t - M\,t\text{-}1) + Ut$$

where: Rt = stock or reserves at time t
Mt = stock of monetary base at time t
Ut = error term satisfying standard assumption
R*t = desired stock at time t , and
M*t = desired money supply at time t

The above equation implies that whenever payments overshoots receipt, the policy makers and the government take fiscal and monetary measures to bring the level of reserves back to the target level. More specifically, if there is a desire to maintain a target of reserves are * t , in period, effort are made in each period any discrepancies between desired level are * t, and the stock of reserves in period (t-1) by a certain proportion β.

Wan Latifah Wan Mohamad
Financial Sector Reforms in the Asean Economies as a Consequence of Illiquidity in the 1980s: Macromodelling of Debt and Twin Deficits, April 1998

In this research work we built a macro-economic model namely the debt-twin deficits model which addressed three issues: ***i***. the linkages between twin deficits and increased indebtedness; ***ii***. the details of internal policies that have effects on the twin-deficits and increased indebtedness and iii. the linkages between debt, twin-deficits and output.

The first issue involves the broader mechanism that explains the link between the government, the

private and the external sector balances, and their links to changes in debt. Previous studies on the twin deficits covered the first part of this issue and give evidence for the United States that the government sector caused the unprecedented level of external deficits in the mid 1980s and early 1990s. In our case, we argue that the change in debt equals the external deficits because according to our findings debt and deficits seem to co-move.

Our macromodel also focuses on the second issue, i.e. the details of the internal policies that affect each of the three sector deficits and eventually increased indebtedness. The variable involved are numerous such as tax policies (rates, revenues, elasticities, etc.), financial policies (interest rates, investment versus savings behaviour, etc.), trade policies (import liberalisation/control, export strategies, exchange rates, prices, etc.), debt policies, etc. as shown in the system of simultaneous equation. Although the variables are numerous there are some common one appearing together in either tow or all the three of the system of equations which are expected to cause movements in the system. Obviously, consideration has to be made on their significance, magnitude and signs.

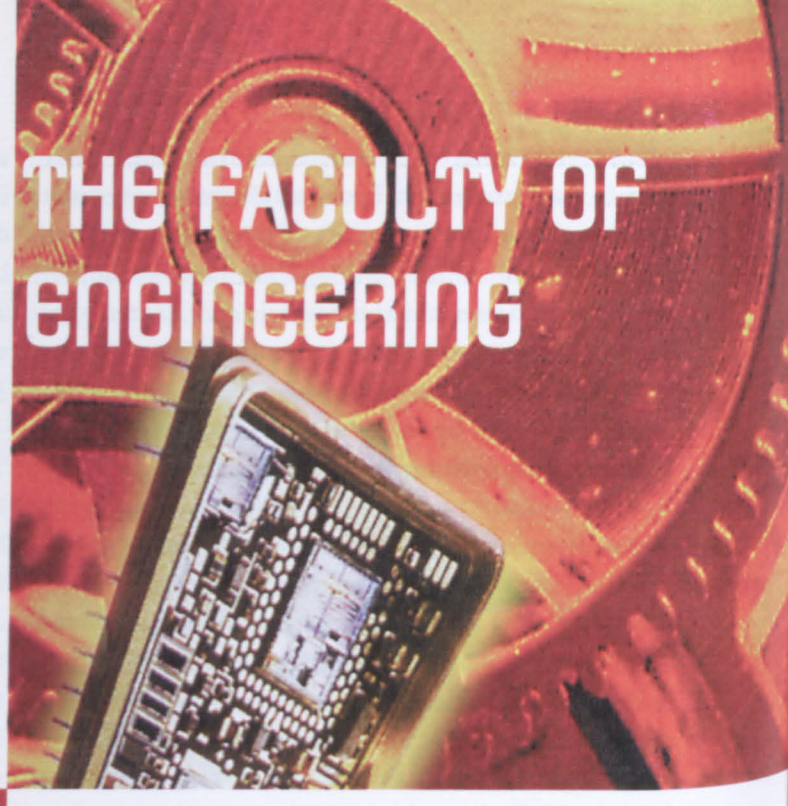
The third issue involves recognising the supply side in response to debt and deficits which are demand-side management. The model thus ensures not only equilibrium in the internal and external sectors but also equilibrium in aggregate supply and aggregate demand. The former equilibrium always holds because the identity (1.1) serves as a constraint. For the latter equilibrium to hold, either one or a combination of the price variables found in the system adjusts to maintain equilibrium in the short-run, while output adjusts to maintain equilibrium in the long-run.

M.G. Kanbur and Dr. Rujhan Mustafa
Japanese Experience in Handling Migrant Workers: Lessons for Malaysia, MIER, May 1998

The internalisation of economic activities involves several aspects ranging from the transaction of goods to the dissemination of information and the transfer of technology. The migration of labour (migrant workers) has exerted increasing impact on the country's economy. Japan was probably the only country amongst industrial countries that achieved high economic growth without introducing many migrant workers. Japan however became involved in the realities of an influx of migrants flowing from developing Asian countries. As a result of this change in policy of accepting migrant workers, the Japanese government established a channel through which one quarter of foreign trainee workers entered Japan.

This paper examines the Japanese experience in handling migrant workers especially when Japan became a labour importing country. The objective of this paper was to examine training schemes in Japan, which provided foreign trainees to acquire certain techniques, skills and knowledge. The technical intern training system started in response to industrial demand so that the industry can cope with its internal shortages of labour. The conclusion arising out of this study is that technical training programme and other conventional training programs may be oriented to cope with labour shortages and transform themselves in to a new scheme for unskilled and semiskilled workers. Japan has always resisted allowing unskilled migrant workers.

Malaysia is presently going through the same experience of handling migrant workers and may have some lessons to learn from Japanese experience in dealing with legal and illegal migrant workers. It should be noted that while illegal migration is not acceptable and legal migration is kept within a limit, the Malaysian government like the Japanese government can not ignore the high potential demand by industries for migrant labour.

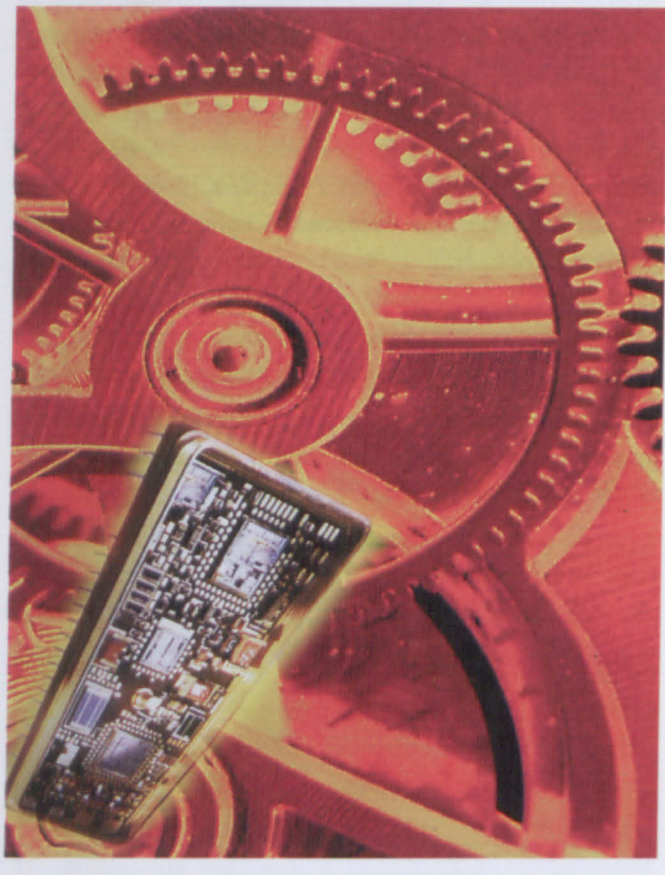


THE FACULTY OF ENGINEERING

INTRODUCTION

Engineering is concerned with the integration of science and technology and the development of useful applications in the commercial world. The field of engineering is vast. In UNIMAS, our research programmes covers a comprehensive range of specialisations under the three main engineering disciplines of Civil, Electrical and Electronics, and Mechanical engineering.

The Faculty is very well equipped with computing facilities including workstations, local area network and internet services. Excellent research facilities have been established to support programmes in Civil Engineering



including sophisticated and modern laboratories for research in geotechnical engineering, materials and concrete, environmental engineering, structural engineering, fluid mechanics and hydraulics. Research areas identified as core activities within the Faculty's Electrical/Electronics Engineering programmes include: Integrated Services Digital Network (ISDN), Wireless Local Area Network (WLAN), switching and transmission systems, mobile communications systems, optoelectronics and optical communication systems. The Mechanical Engineering programme has also concentrated efforts on establishing an excellent Computer-Aided Engineering (CAE) laboratory and has been active engaged in research and development of engineering and mathematical modeling software packages.

The Faculty has established external links with local industries in various fields such as construction, geotechnical engineering, telecommunications, electronics and manufacturing. These links enabled our research programmes to be tailored to the specific needs of the related industries. Also, international links with several overseas universities have been established to provide a closer academic and research collaborations with the Faculty.

RESEARCH PROGRAMMES

Soft Mineral and Organic Soil Engineering

The impetus from development has resulted in great demand for land areas. In Sarawak this has been complicated by the availability of marginal land areas that occupy a continous corridor along the entire coast of the State. Soft soils, namely, soft mineral and organic soils like peat present a new domain that beseeches delineation and categorisation. New innovative engineering technologies are required in harnessing them due to the inapplicability of conventional procedures and practices. Our research activities have thus focused on pertinent areas such as the Inventory of Geotechnical Database (depth survey, water content, type, index properties - Atterberg's limit,

organic content, van post classification, fibre content), Engineering properties/behaviour research (classes of materials, properties - compressibility, strength, permeability, range of engineering values for different classes of soft soils), Guidelines for construction (appropriate technologies/ground improvement schemes, instrumentation and monitoring plans, solution of specific local problems) and construction and post-construction monitoring

Hydraulic and Water Resources Engineering

Our work at present concentrates on hydraulic structures, in particular the energy dissipater. A study has been initiated in assessing the magnitude of energy that must be dissipated at high dams with large spillway discharges. The stilling basin is the most common form of energy dissipater. The energy is dissipated through a hydraulic jump. An increase in the dissipated energy would result in a shorter stilling basin and substantial reduction in the erosion of the downstream channel. For this purpose, the feasibility of chute blocks and end sills were investigated. Triangular baffle blocks have been shown to increase the dissipated energy by 15% compared to the use of regular baffle blocks. This study has also shown that blocks with an upstream face sliding vertically will induce a stronger vortex and enhance hydraulic energy dissipation. The hydraulic performance of this type of blocks will be investigated for different configurations and positions. The study will result in determining a design procedure for a stilling basin with theses specially shaped blocks.

Remote Sensing, GIS and Non Destructive Testing (NDT) Techniques

At present our research focuses on the application of remote sensing and GIS to hydraulics and hydrology, while that of the NDT for the concrete technology. Remote-sensed data comprising of spatially integrated information has the potential of complementing and even replacing conventional ground measurement for hydrologic modeling. Remote Sensing (RS) techniques can provide useful information on hydrological model that can in turn maximise the utility of a spatial information of RS data for various physiographic and climatic area. Land surface temperature is a key parameter in many remote-sensing applications. This temperature can be estimated from remotely sensed infrared radiance. Two major phenomena have direct effects on the infrared radiance received by the satellite, namely atmospheric effects and surface emissivity. Corrected land surface temperature maps were determined for the region of Northern Borneo and these maps are critical in our understanding of the surface emissivity and atmospheric effects. Potentially these data can be used to develop an evapotranspiration model.

In the field of non destructive testing, work has started on the use of the Ground Penetrating Radar GPR technique. Recently this (GPR) technique has become increasingly attractive, particularly in the application of non-destructive testing. Traditionally, the checking of grouted concrete pile quality has been performed through the use of acoustic wave. An alternative method has been sought to use GPR for the imaging of defects occurring in a grouted concrete pile. Tomography tests were carried out by measuring the wave transmissions registered through varying the transmitter antenna location in one borchole and the receiver antenna location in another borchole. The tomography images obtained clearly showed that the GPR technique can effectively locate and image the defects in a grouted concrete pile. Research in this area has received funding from the Norwegian Geotechnical Institute, Pilecon Engineering Berhad and UNIMAS.

Toxic Chemicals Prioritization Modeling

This work involves the development and application of an environmental model based on the amount of toxic pollutants released into the environment. The approach is to quantify in a relative sense, the potential health risks of the inplant workers and population proximate to a facility. Also, it takes into consideration the relative toxicity of chemicals, volume of the pollutants released into the air, contaminants transported in the plume, and atmospheric fate of chemicals. The end result is to produce a rank-ordered list of Chemical Health Risk Index Number (CHRIN) values for any facility that releases toxic chemicals into the air. The higher the CHRIN value, the more problematic is the chemical. These indexes are particularly useful to facilities in devoting their limited resources more effectively to research on toxic use reduction technologies and methods, or prioritize a facility's research agenda.

Probabilistic Human Exposure Modeling Applied to Carbon Monoxide

The objective of this research is to estimate the frequency distributions of population exposure to carbon monoxide and the resulting carboxyhemoglobin levels within a defined study area. The existing model can be modified to model population exposure to other ambient criteria pollutants such as suspended particulate matters, lead, and Nox. The model was put to run and evaluated while as a visiting scientist to the United States Environmental Protection Agency (1994-1995).

Municipal and Industrial Wastewater Treatment and Pollution Control

Research areas include the improvement of the existing wastewater treatment processes that often fail to perform as intended. This may be due to unforseen factors not considered in the plant design and are usually related to upsets in the biological process itself or to inefficiencies in chemical treatment processes.

Broadband ISDN and Digital Wireless Local Area Network

The Standardization of the ISDN (Integrated Services Digital Network) has been completed and many countries have introduced this network to their existing telecommunication infrastructure. The most important advantage of the ISDN is that end users can have integrated access to voice, data and other services by transmitting digital signal over existing paired cables. On the radio technology the second-generation digital mobile communication system has been introduced and gained overwhelming attention worldwide. This rapidly developing mobile telecommunication system will pave the way for a third generation system in which it allows the integration of ISDN into the radio system by incorporating a new technology of digital wireless local loop.

It is therefore necessary to investigate this new technology for the expansion of the local loop and participate in the international standardization activities in this area. One of the problems with mobile systems is the limitation of subscriber capacity. Other research objectives in this area include ways to increase the capacity of the mobile local loop by utilizing the technology of ISDN. In the field of WLAN, a wireless transmission technology is introduced as an alternative networking technique to provide greater mobility and flexibility. With the combination of wireless Engineering Computer and Information Network (ECIN) and the ISDN, this could lead to experimentation and development of appropriate protocols for the required technology.

Optical Instrumentation and Systems Development

This research is concerned mainly with the characterization of optical fibers and other devices as used in modern communication systems. This include fiber optic sensor development in determining the parameters of a particular environment with respect to its temperature, pressure, flow rate, particle size distribution etc. These parameters are remotely measured by optical fiber based sensors. Another approach in sensor development, apart from empirical technique, is to use computer-based modeling techniques. Again, the work will look at various sensors, such as temperature, flow, pressure, modeling, etc and where possible, physical models are constructed to check the validity of the modeling.

Design of analogue and digital modulation systems based on pulse time modulation techniques for the transmission of single and multiplexed data and video signals over optical fiber cable is also undertaken. This include a cost effective and bandwidth efficient system for transmission of wideband signal and the modulation chosen is compatible with the existing communication networks and must also have the capability for use in point-to-point link.

Laser Based Signal Processing

A high-speed optical studies system based on two outputs of Mach-Zehnder interferometer has been developed to study acoustic wave propagation and the associated transient pressure profile. The system takes advantage of the combination of the phase shifting interferometry and Fast Fourier Transform (FFT) filtering to map the dynamic phase changes due to the disturbance caused by laser interaction. The mapping of the phase changed, in two and three dimension by phase measurement

method provide more information of the phase change over the whole area of the interferograms. The cross-section of the phase change can be used to evaluate the pressure profile. This pressure profile is useful in determining the structural behavior and stress factor of the medium.

Another approach developed here in UNIMAS is the analysis of the images on UNIX platform by creating software that could read Windows bitmap files and obtained the values of the distorted fringes and then produce the refractive index profile. The pressure profile could then later be obtained via further analysis on UNIX. It is hoped to develop a full phase mapping of the images on UNIX once the preliminary works are completed.

Advanced Materials

The use of composite materials in modern aircraft and high performance automobiles has increased significantly in the last few decades. Over the next twenty years, it is estimated that their use, in the form of, for example, carbon fibre reinforced plastics (CFRP) will increase by about 10% in civil aircraft and helicopters. When designing a structure, it is useful to be able to predict the effects of damage on both the mechanical properties and subsequent behaviours of the components/material. It is only with sufficient and satisfactory knowledge of the effects of the in service conditions on the material characteristics that these materials can be utilised to their best effect. Our interests in the area of advanced materials can be categorised into two main areas: i. Effects of damages on the mechanical properties of Carbon Fibre Reinforced Plastics and ii. Metal Matrix Composites - processing technology, casting, powder metallurgy, hot isostatic pressing, heat treatment and mechanical properties.

Computer Aided Engineering

The concept of factory automation encompasses a wide area of data acquisition, programmable controllers, machine vision, robotics, real time control and monitoring along with computerised design, planning and management functions. Such a number of different tasks have to be coupled to each other by efficient information flow. Several research areas have been identified which include: ***i***. Integration - The integration of communication devices at a higher level has already been achieved, e.g. downloading of programs through MAP or TOP. However, the integration at a low level, i.e. the shop floor, has been slow due to lack of standards, low speed communication capabilities and non-suitability for the noisy environment of a factory; ***ii***. Investigation on the benefits of 'shared' or 'intelligent' controller to improve systems reliability; ***iii***. Condition Monitoring, Fault Diagnosis and Maintenance Management - The applications of AI and pattern recognition for monitoring and diagnosis of the current state of a plant or equipment and ***iv***. Development of SMART sensors - A large percentage of system failures can be caused by sensor malfunctions and failures. Therefore, there is a need for improvement in sensor reliability.

Energy Studies and Management

Expertise in energy management will place a graduate in a strong position to contribute to strategic use of energy as a global resource. The Rio Earth Summit resulted in a commitment from most governments of the world to reduce the emission of carbon dioxide to 1990 levels by the year 2000. This was in response to the threat of global warming, in part, from fossil fuel. Conscious of the needs to provide engineers with expertise in energy management, the faculty has started a research programme to provide engineers with the relevant skills and understanding to respond to this challenge.Among the main interests in this area include ***i***. Renewable Energy - The hydro power, solar energy and and biomass; ***ii***. Energy Generation and Optimisation - Batang Ai Hydroelectric Power Station

Fracture Mechanics and Computational Techniques

Knowledge of the state of stress around cracks in solids is crucial in gaining a better understanding of the behaviours of the cracks. A study has been initiated to devise effective mathematical methods for calculating the stress distribution around the tips of cracks in elastic media, particularly those that are made up of two or more dissimilar anisotropic materials adhering perfectly to one another. The approach used is to formulate the task of calculating the stress distribution around cracks in terms of the hypersingular integral equations. The hypersingular integral equations can be solved

approximately but accurately and efficiently with the aid of a computer. Once they are solved, crack parameters of interest, such as the cracked tip stress intensity factors, can be easily calculated. Computer algorithms are developed for solving the hypersingular integral equations.

Computational Techniques in Engineering Mechanics

Many important problems in engineering mechanics may be formulated in terms of partial differential equations. These problems can be potentially solved through suitably prescribed initial and/or boundary conditions. For most realistic problems, the initial-boundary value problems can only be solved approximated using computational techniques implemented on the computer. Several projects on computational techniques covering areas like thermoelasticity, boundary element method, finite difference technique and parallel computing have been successfully carried out at the Faculty.

Elasticity

The basic equations that govern the deformations of elastic solids have been known for several centuries. The solutions of the equations for inhomogeneous solids, particularly those with elastic moduli that vary continuously in space, are rather few, however. An on-going project is to develop mathematical methods for solving the equations for an increasingly wider range of inhomogeneous materials.

RESEARCH COMMUNICATIONS

A. PUBLICATIONS AND CONFERENCE / SEMINAR PRESENTATIONS

Bujang B. K. Huat
Observational Method of Predicting the Settlement
Twelfth Southeast Asian Geotechnical Conference. Kuala Lumpur, May 1996

In this paper a number of high quality long-term field settlement data were used to verify the applicability of one of the observational methods that is the hyperbolic method. The field data were from the Tangkak trial embankment (1987 - 1993), and the Juru trial embankment (1990 - 1992). It was found that the hyperbolic method offers a means of extrapolating settlement behaviour based on available settlement data. However the accuracy of the prediction is found to be limited to about 1 to 2 years. Thereafter the actual settlements may differ significantly from that of the predictions. Long term settlement predicted based on early stage data is also found to be misleading.

Harwant Singh, H.M. Bahia & Bujang B. K. Huat
Varying Perspectives on Peat, its Occurrence in Sarawak and Some Geotechnical Properties
Recent Advances in Soft Soil Engineering. Kuching, March 1997

Peat deposits, covering about 13% of the land area of Sarawak amounting to around 16,500 km2, have been investigated by various agencies through several varying perspectives. This paper draws contrasts between two perspectives, namely, soil science and the geotechnical engineering, to enable each of these diverging interests to appreciate and, if possible, sow the seed for synergism between the two. It also brings forth the data on the occurrence and distribution of peat in the state, expounding the morphology of these deposits and highlighting some of its characteristics particularly its internal fabric.

Nabil Bessaih
Methods of reducing the erosion from cells in concrete block spillway
Proceedings of the Institution of Civil Engineers Water, Maritime and Energy, 1996, 118 September, 199-203

In recent years concrete blocks with cells have been extensively used to provide auxiliary dam spillways or to protect other surfaces subjected to supercritical flow. When cells are filled with topsoil and grass allowed to grow, their use is currently limited by the Construction Industry Research and Information Association (CIRIA) guidelines to a maximum velocity of 8 m/s. In addition a geotextile underlayer is recommended to prevent damage to the embankment material when soil and grass is eroded from the cells in a flood. The mechanism of removal of granular material from a cell by flowing water is presented in this paper. Two simple modifications to the cell geometry are also described which reduce the depth of erosion by at least 50%. Such modifications would limit the amount of

maintenance necessary to the spillway after a flood and reduce the reliance upon the geotextile to prevent failure.

Nabil Bessaih
Erosion of sediments from rectangular and square cells
10th Congress of the Asia and Pacific Division of the International Association for Hydraulic Research, Langkawi, August 1996

Preventing overtopping of potentially unsafe dams, with inadequate spillway capacity, requires costly modifications to the spillway or raising the embankment. This cost however can be reduced by using all or a portion of the dam crest length as an emergency spillway that must be adequately protected. A protective structure consisting of cellular concrete blocks can reduce the erosion whilst maintaining the visual appearance of the grass bank. However, tests showed that a significant proportion of the cells would wash clear of topsoil and grass sods by the water and hence a geotextile was recommended under the blocks to prevent possible tunnel erosion of the embankment. This paper presents the results of an experimental investigation on the equilibrium depth of erosion and the flow in the cells. These tests have shown that at high velocity flow the depth of erosion is higher that the thickness of some manufactured blocks and the flow in a cell consists of only one vortex, contrary to the double vortex reported by some authors.

Nabil Bessaih
Satellite Land Surface Temperatures for Sarawak Area
18th Asian Conference on Remote Sensing, Kuala Lumpur, October 1997

Land surface temperature is a key parameter in many remote-sensing applications. This temperature can be estimated from remotely sensed infrared radiance. Two major phenomena have direct effects on the infrared radiance received by the satellite, namely atmospheric effects and surface emissivity. Many algorithms have been developed to take into account these effects. This paper presents the results of a study that aimed to evaluate the importance of these effects in the region of Northern Borneo. The study involves the implementation of an algorithm that corrects water vapour and emissivity effects on the estimated land surface temperature. This algorithm uses the split window method that measures the temperature using two different infrared channels. Uncorrected and corrected land surface temperature maps were determined for the region under study. These maps show the importance of the surface emissivity and atmospheric effects.

F. N. Kong, H. M. Bahia, Bujang B. K. Huat
Radar Tomography Checking Concrete Pile Integrity
NDT in Civil Engineering, British Institute of Non-Destructive Testing, Liverpool, April 1997

The Ground Penerating Radar (GPR) technique becomes increasingly attractive in the application of non-destructive testing. Traditionally, the check of grouted concrete pile quality has been performed by using the acoustic wave method. To provide an alternative method for the above purpose, an investigation has been carried out using GPR to image the defects in a grouted concrete pile. Ten concrete piles for test purposes were built at Universiti Malaysia Sarawak. Those concrete piles were about 3m long and with diameters of 0.6m, 0.9m and 1.2m. Most of them were reinforced with steel bars. Two or four plastic pipes for tomography measurements were installed in each pile when the piles were constructed. Different kinds of defects (sand layer, construction joints, small objects of wood, plastic et.) were introduced during construction. The GPR system, which used a wide bandwidth step frequency signal, was employed for testing. The frequency bandwidth of the system was chosen within 0.3 - 3000 MHz. The borehole antennas used were 3 cm in diameter and 50 cm in length and these corresponded to a centre frequency of 300 MHz in air. The tomography tests were made by measuring the wave transmissions generated through varying the transmitter antenna location in one borehole and the receiver antenna location in another. The arrival time and the magnitude of the transmission wave, which will change when the wave met the defect object, were used as the input for the tomographic inversion. The tomography images obtained for the test piles clearly showed that the radar method was able to locate and image the defects in a grouted concrete pile.

Khairuddin Ab Hamid, Ng Liang Yew & Allen Liew Than Ho
Wireless Local Area Network: A New Technology in Computer Communications
2nd International Conference on Communications and Computer Networks Kuala Lumpur, Aug. 27 - 29 1996

This paper describes a new approach in computer communications for local area network (LAN). A wireless transmission technology is introduced as an alternative networking technique to provide greater mobility and flexibility. Detailed discussion on the various technologies commonly used to develop wireless LANs is presented. The technologies are spread spectrum, narrowband microwave and infrared. Various network configurations that can be easily implemented by using the wireless approach are presented and discussed. This paper also gives a brief account of the experience of implementing a wireless LAN for the Faculty of Engineering at Universiti Malaysia Sarawak (UNIMAS).

L.Y. Ng
Design Strategies for Deployment of Wireless LAN
IEEE National Conference on Telecommunications Technology 1996 Kuching, December 3 - 5 1996

The use of Wireless Local Area Network (WLAN) has been established for quite sometimes. Even with the various types of WLAN that exist in the world today, their installation in terms of the hardware have been easy. However, the overall implementation of the network needs to be carefully dealt with. The actual needs of WLAN, location for it to be implemented and other factors, all these have to be taken into consideration before decision is made on its feasibility. A strategic framework design will therefore provide a useful decision making process for WLAN before the actual implementation. The framework can be of importance to determine the cost-effectiveness of the network to be implement. In this framework design, consideration such as site verification, Radio Frequency (RF) environment, floor plan, pilot development and analysis are taken to fulfil the overall feasibility of WLAN before its actual implementation. These factors are evaluated with respect to the effectiveness of WLAN from the usage standpoint to the actual performance. This paper provides a design strategy framework that can be use for decision making on the cost-effectiveness of implementing WLAN.

L.Y. Ng, Kevin Y.B. Lee
Performance Monitoring and Messaging Device For Wireless LAN - A Preliminary Study
IEEE National Conference on Telecommunications Technology 1996 Kuching, December 3 - 5 1996

With the increased usage for mobility and flexibility of computers, wireless Local Area Network has become an emerging technology for today's computer and communication industries. The sophisticated features and services on this wireless Local Area Network (LAN) have produced many factors that need to be addressed especially in terms of its performance. One of the important issues is the need for monitoring and managing the performance of wireless LAN. This paper is a preliminary study of the wireless LAN which first addresses the basic LAN technology, the spread spectrum transmission techniques, wireless communication technologies, the operation and application of wireless LAN. Through this basic understanding, the second section discussed the study on the performance monitoring and measuring device for wireless LAN. Questions such as what type of networking being used and what to monitor or measure are answered through these studies. With this knowledge, an idea on developing a network-monitoring agent is the main outcome from these studies.

Khairuddin Ab Hamid, Ng Liang Yew
WLAN: A New Technology in Computer Networking
20th Asian ISDN Council Working Groups Meeting and Conference Kuala Lumpur, March 2 - 6 1998

This paper addresses the use of wireless local area network (WLAN) as a new technological approach in computer networking. The key requirement of this approach is the ability to access critical data from shared file systems and databases regardless of location, which means greater flexibility and mobility. WLAN allows personal computer to communicate and to access the network using radio propagation as the transmission medium. An account of the technology commonly used in developing WLAN is also presented here. Also included in this paper are the benefits and drawbacks of WLAN. A case study on the implementation of the network has been conducted and its effectiveness has also been tested. From this case study, the finding demonstrated that wireless local area network could provide another effective

alternative to the already existed traditional networking environment.

Ng Liang Yew, Khairuddin Ab Hamid
Wireless Local Area Network: A new Technology in Campus Networking
ASAIHL Seminar on Technology-Assisted Teaching and Learning in Universities. Kuching, 10 - 12 August 1997

To allow data to be accessed from shared file systems and databases between computers at various locations, flexibility and mobility are required. Wireless Local Area Network (WLAN) is the current technology to fulfil these requirements. This paper addresses the issues of WLAN as a new technological approach in computer communications on campus. The WLAN standards, benefits and drawbacks are also addressed in this paper. A case study on the implementation of WLAN on campus is also presented.

D. C. Emmony, Mohamad Kadim Suaidi, Y.H. Jin, B. Ward
Laser Generated Shock Waves
Proceedings of the 19th International Symposium on Shock Waves Marseilles, France, July 26 - 30 1995

The optical breakdown of materials by intense laser radiation has been studied using the interaction of a Q-Switched, focused laser pulse with the free surface of a solid. If the peak optical power density at the focus exceeds the threshold for optical breakdown or if heating, vaporization and ionization of the material take place, this leads to the generation of acoustic transients. If the pressure amplitude in these waves is large enough, shock waves are produced. The energy exchange rates and pulse duration of a small Nd-YAG laser are such that shock waves may be produced in a range of materials. Optical diagnostics have been developed using simple video recording techniques and interferometry allows quantitative measurements of the pressure field in the breakdown zone.

S. Al-Zubaidy, Ha How Ung, Mohd Omar Abdullah
Integrating CAE/CAD concept into Mechanical & Manufacturing Systems programme at UNIMAS
Seminar on Technology-Assisted Teaching and Learning in Universities 11 - 12 August 1997.

The present paper describes briefly the current effort to implement computer-aided education method into the curriculum of Mechanical Engineering & Manufacturing Systems Programme. The trends towards implementing this concept by the programme include university-industry collaboration and more importantly the Faculty's effort to establish the integrated computer-aided design laboratory.

Al-Zubaidy, S., and Rigit, A
Performance Investigation of a Hydroelectric Power Station at Batang Ai, Sarawak
International Journal of Energy Research, Vol. 21 (1997), 1405 -1412.

Hydraulic power generation is known to offer one of the cleanest energy supplies. However, much emphasis in these plants appears to be directed towards condition monitoring (based on typical weekly and monthly data gathering) and less attention is directed towards continuous performance monitoring. This paper offers an investigative study of the effect of some performance parameters such as inlet and outlet relative flow angles, nozzle angle, hydraulic turbine efficiency on the overall performance of a 108 MW station using four identical vertical shaft Francis turbines. The results of the study indicates that for a given energy supply, determined by the available head, a one percentage point improvement of the turbine efficiency might lead to increased earnings of about 1.25%.

Al-Zubaidy, S.N., and Rigit, A.R.H.
Investigative Study to Improve the Performance of a Hydroelectric Power Station
ASME Fluid Machinery Forum, FEDSM'97, June 22-26, 1997, Vancouver, British Columbia, Canada, FEDSM97-3449.

The performance of a 108 MW hydroelectric power station (located in the state of Sarawak, Malaysia) is investigated. A prediction program (designed specifically for the station) had been written to

identify the optimum operating conditions within the specified manufacturing and operational constraints. The study indicated that the overall efficiency of the generating units could be raised. The optimum rise (for a given energy input) will rise the generating authorities earnings by about 1.2 percentage points.

Al-Zubaidy, S., and Rigit, A.
Performance Evaluation of a Hydroelectric Power Station
International Symposium Advances in Alternative/Renewable Energy, 22-24 July 1997, Universiti Teknologi Malaysia, Johor Bahru, Johor, Malaysia, pg. 251-258

The hydraulic power generation is known to offer one of the cleanest energy supplies. However, much emphasis in these plants appears to be directed towards ensuring adequate overall condition of the plant and less attention is directed towards continuous performance monitoring. This paper offers an investigative study that will help operating and maintenance staff at the power station to operate the Francis turbines at optimum performance. Results of the effect of parameters such as inlet and outlet relative flow angles, nozzle angle, turbine efficiency on the overall performance of 108 MW station using four identical vertical shaft Francis turbines will be shown. The results of the study indicated that for a given energy supply a small improvement of the turbine efficiency will lead to substantial increase in earnings.

Rigit, A.R.H., and Low, T.K.
Optimum region of operation for a 108 MW Hydroelectric Power Station
Symposium Section on Hydraulic Machinery and Cavitation, 9-11 September 1998, Singapore.

Much emphasis in hydroelectric power plants appears to be directed towards condition evaluation and less attention is directed towards performance improvement. This paper offers an investigative study that will help operating and maintenance staff at a 108 MW hydroelectric power station to operate the hydraulic Francis turbines at optimum performance within the permitted range. The results of the study indicated that for a given energy supply, a small improvement of the turbine efficiency would lead to substantial increase in earnings.

W.T Ang, D.L. Clements and T. Cooke
A hypersingular boundary integral equation for a class of antiplane crack problems for inhomogeneous elastic materials,
Proceedings of the First UK Conference on Boundary Integral Methods, 1997, University of Leeds, UK, edited by L. Elliots, D. B. Ingham and D. Lesnic 12-18.

In this paper, an antiplane crack problem is considered for inhomogeneous isotropic materials. The problem reduces to solving a boundary integral equation involving hypersingular integrals. This integral equation may be solved numerically using standard procedures. A crack problem for a particular inhomogeneous material is considered in detail and the stress intensity factors are obtained in order to assess the effect of inhomogeneity on the stress field near the crack tips.

W.T. Ang
A hypersingular-boundary integral equation method for cracks in an anisotropic elastic half-space with a partly irregular boundary,
Proceedings of Conference on the Boundary Element Method, 1997, Universita "La Sapienza" di Roma, Rome, Italy, edited by M. Marchetti, C.A. Brebbia and M. H. Aliabadi 339-347

The two-dimensional problem of analysis the interaction between planar cracks and the boundary of an anisotropic elastic half-space is formulated in terms of a system of hypersingular-boundary integral equations. The boundary of the half-space is partly irregular. For a specific example, the integral equations are solved numerically.

W.T. Ang and D.L. Clements
Hypersingular integral equations for multiple interacting planar cracks in an elastic layered material under antiplane shear stress
Engineering Analysis with Boundary Elements 16 (1995) 289-295.

A system of Hadamard finite-part singular integral equations is derived for an antiplane elastic problem involving an arbitrary number of arbitrarily-located planar cracks in a tri-layered material. The equations are solved approximately to compute the stress intensity factors for certain specific cases.

W.T. Ang and D.L. Clements
A periodic array of staggered planar cracks in an anisotropic medium
Engineering Fracture Mechanics 53 (1996) 941-946.

The problem of determining the elastic displacements and stresses in an infinite anisotropic medium containing a periodic array of staggered planar cracks is considered. It is reduced to a system of Hadamard finite-part singular integral equations with the crack-opening displacements as unknown functions. The integral equations are solved numerically for specific cases.

W.T. Ang and Y.S. Park
Stresses around a periodic array of planar cracks in an anisotropic bimaterial
International Journal of Engineering Science 34 (1996) 1457-1466.

The problem of calculating the stress distribution around a periodic array of cracks in an anisotropic elastic half-space which adhere perfectly to another anisotropic half-space is considered. It is formulated in terms of a system of hypersingular integral equations with the crack-opening displacements as unknown functions. The integral equations are solved numerically for specific cases in order to compute crack parameters of interest, such as the crack tip stress intensity factors.

W.T. Ang and A.B. Gumel
Multiple interacting planar cracks in an anisotropic multilayered medium under an antiplane shear stress: a hypersingular integral approach
Engineering Analysis with Boundary Elements 18 (1996) 297-303.

The problem of determining the stress field around an arbitrary number of arbitrarily-located planar cracks in an anisotropic elastic half-space which adhere to an infinitely-long elastic strip is considered. The strip is made up of several layers of anisotropic materials which adhere perfectly to one another. The cracked multilayered material is assumed to under an antiplane deformation. Suitable integral expressions are used to represent the displacement and stress fields, leading to a system of hypersingular integral equations to be solved. The problem under consideration may be of interest to practical situations in which cracked structures are patched or reinforced with different materials such as in the repairs of aircraft.

W.T. Ang and Y.S. Park
Hypersingular integral equations for arbitrarily-located planar cracks in an anisotropic bimaterial
Engineering Analysis with Boundary Elements 20 (1997) 135-143.

Hypersingular integral equations are derived for the problem of arbitrarily-located planar cracks Iying in the interior of two dissimilar anisotropic elastic half-spaces which adhere perfectly to each other. The unknown functions are the crack-opening displacements. The integral equations are solved numerically for specific examples involving particular transversely-isotropic materials in order to compute physical quantities of interest such as the stress intensity factors and the crack energy.

W.T. Ang
Hypersingular integral equations for cracks in an anisotropic multilayered half-space under antiplane shear stress
SEA Bulletin of Mathematics Volume 22 Number 3.

Hypersingular integral equations are derived for the problem of planar cracks in an elastic half-space which consists of several layers of dissimilar anisotropic materials. The cracks are acted upon by suitable prescribed antiplane shear stress and they lie near the stress-free edge of the half-space. For specific cases, the integral equations are solved numerically to compute the stress intensity factors. From a practical standpoint, the problem is of useful relevance to composite and anisotropic structures which may now be found in an increasingly wider range of applications in modern technology, e.g. media comprising many very fine layers are used in optical recording.

W.T. Ang, D.L. Clements and T. Cooke
A boundary element method for plane thermoelastic deformations of elastic media
Proceedings of the 18th World Conference on the Boundary Element Method, 1996, University of Minho, Braga, Portugal, edited by C.A Brebbia, J. B. Martins, M. H. Aliabadi and N. Haie 95-103.

A boundary element method is derived for solving a class of boundary value problems governing plane deformations of isotropic elastic bodies. The method

involves boundary integrals only and it provides a simple boundary element procedure for a wide class of problems which do not involve inertia or coupling effects. To assess its effectiveness, the method is employed to solve some test problems.

W.T. Ang
A complex variable boundary element method for two-dimensional elliptic boundary value problems
Proceedings of at the 29th Annual Iranian Mathematical Conference, Amirkabir University of Technology, Tehran, 28-31 March 1998.

A boundary element method based on Cauchy's integral formulae is developed for the numerical solution of boundary value problems governed by second order linear partial differential equations in two variables. It reduces the boundary value problem under consideration to solving a system of linear algebraic equations and can be easily implemented on the computer.

W. T. Ang, J. Kusuma and D.L. Clements
A boundary element method for a second order elliptic partial differential equation with variable coefficients
Engineering Analysis with Boundary Elements 18 (1996) 311-316.

A boundary element method is derived for solving a class of boundary value problems governed by second order elliptic partial differential equation with variable coefficients. Numerical results are given for specific test problems.

A.B. Gumel, W.T. Ang and E. H. Twizell
Efficient parallel algorithm for the two-dimensional diffusion equation subject to specification of mass
International Journal of Computer Mathematics 64 (1997) 153-163.

An efficient parallel algorithm is developed for the two-dimensional diffusion equation with non-local time-dependent boundary conditions. It can be implemented on a parallel computer architecture using two concurrently running processor. The algorithm is tested on two test problems.

D.L. Clements, W.T. Ang and J. Kusuma
A note on antiplane deformations of inhomogeneous elastic materials
International Journal of Engineering Science 35 (1997) 593-601.

This paper formally obtains the solution of the equations of antiplane inhomogeneous elasticity in terms of an arbitrary analytic function for the case in which the material shear modulus varies continuously with two Cartesian co-ordinates. The solution is applied to solve a particular boundary value problem involving a crack in an inhomogeneous material.

THE FACULTY OF APPLIED AND CREATIVE ARTS

INTRODUCTION

The advent of new technologies is bringing about changes in the world of the arts today. New and innovative ideas have been generated by the interactive nature of contemporary communications media. There is an accelerated globalization and a growing consciousness of cultural diversity. In response to these changes, the Faculty of Applied and Creative Arts has focused its research activities on two apparently divergent agendas. One is the development, documentation and conservation of our traditional and cultural heritage and another is exploring the emerging technologies of digital media. The faculty benefits from the rich cultural resources of Sarawak and Borneo and also from up to date technology. The faculty is equipped with an excellent computer-aided design studio which includes Silicon Graphics, Macintosh and P.C. labs, Industrial Design and Stagecraft Workshops, Digital Interface (MIDI studio), Music Studio, Experimental Theatre, Broadcast quality video Editing Studio, Textile, Ceramic and Fine Arts Studios. The research undertaken by the faculty covers a wide range of disciplines ranging from fine art, design technology, music, performing arts to arts management. Members of the faculty are involved in theoretical and applied research including collaboration with industry. The faculty aims to generate new knowledge in the aesthetic, cognitive, social and cultural categories.

RESEARCH PROGRAMMES

Arts Management: Sarawak Crafts

A study on "Sarawak Craft: Market and Product Development" was sponsored by Sarawak Craft Council, Ministry of Tourism, Sarawak. This study draws upon the premise that crafts available in Sarawak, although portraying the image of "primitive arts" of Sarawak, are actually from Kalimantan and other places outside Sarawak itself. Of primary concern is that such situation might pose a threat to the continued survival of Sarawak's own living craft tradition in the face of market competition from Kalimantan's crafts. This study aimed at understanding the market, sales, distribution system, sellers and makers of Sarawak crafts in order to improve their image and market status. From the research findings, an organisational framework for the Sarawak Craft Council was also considered. The main issues identified within the framework also pointed to the need for a community-based approach and the formation of a coordination body of all existing craft-related organizations. There is also a need to actively preserve, develop and promote Sarawak crafts at the State level and subsequently to network and market the crafts at national and international levels.

Arts Management: Cultural Centre

A feasibility study towards the establishment of a Sarawak Arts and Culture Centre (SACC) was also completed. This stemmed from the acknowledgment of Sarawak's wealth in the arts and cultural heritage and the need to enhance the artistic and cultural pursuits in the State. A viable means of achieving this will be the development of a Center for Arts and Culture in the capital Kuching. The study looked at the demand for an art and culture

centre, taking into account the existing needs and views of artists themselves as well as the patrons of art and culture. The questions of how the Arts and Cultural Centre can benefit the community as a whole and the possible mechanism of developing a comprehensive Centre that can mutually reciprocate the teaching and training roles of UNIMAS were also addressed

Electronic Art

The Faculty's engagement in Electronic art reflects in the changes brought about by information revolution. Research projects in Electronic Art were aimed at theoretical and creative engagement in the use of IT in the visual arts, with emphasis on multi-disciplinary convergence between various disciplines. Output from such projects came in a form of art exhibitions, exhibition catalogues with essays (print, CD-ROM and Web sites), lectures/talks, workshops, conference papers, screenings and concerts. The Faculty's projects include 'Jambori Rimba' - a multi-media concert and an audience interactive video/music installation which involved creative use of MIDI/computer music and video, 'HYPERview' - an exhibition of interactive CD-ROM art, video installations, computer animation and digital collage. The most significant achievement was the presentation of the 1st Electronic Art Show which was sponsored by the Ministry of Arts, Culture and Tourism and held at the National Art Gallery, Kuala Lumpur.

Multimedia Theatre

The primary objectives of research undertaken in this area include i. To combine arts and multimedia technology in an effort to preserve Malaysian culture and identity, ii. To study the audience perception and acceptability of changes occurring in the performances and accompanying music of 'wayang kulit', and iii.. To apply computer media into the performances and music of 'wayang kulit'. Wayang 'Virtual' is an experimental attempt at combining traditional 'wayang kulit' performance and the use of a three-dimensional digital model using the 'IRIS Showcase' Silicon Graphic Software. During the performance, the source of light from a projector illuminates the interaction of this 3-D model with the traditional 'wayang kulit' characters. The movements of the model and the traditional characters will be effectively manipulated by two dalangs (puppet masters) accompanied by a background computer-aided music (MIDI). The three-dimensional model will be kept to real time animation movements by using a mouse. The manipulation of colors on the screen is done digitally in accordance with the story line.

Dance and Stage Productions

A stage production of a Neo-Classical Malay Dance Drama called "Kunang-Kunang Gunung Ledang" was realised through a collaborative effort between Suasana Cultural Centre Kuala Lumpur and UNIMAS. The research involved developing basic techniques in classical dance and movements, skills in dance and drama production, production management, stage management, publicity, promotions and sponsorships. The final staging of the dance-drama was under the choreography and direction of Azanin Dato'Ahmad and was performed thrice in Kuala Lumpur. A related Black and White Photography Exhibition on the dance-drama was also held at UNIMAS.

Photography

Under this general research heading, an activity undertaken that has notably produced encouraging results was the documentation of the art forms, lifestyles, cultures, traditions, flora and fauna of the Kelabits of Bario Highlands, Sarawak. The rapid pace of economic development occurring in the State within the last two decades has somehow caused a lot of uncertainties among its indigenous people, including the Kelabit community of Bario. Traditional art forms such as crafts, beadworks, weaving, carvings, paintings, songs, music and epics are slowly disappearing. Urgent measures need to be taken to preserve this unique cultures and art forms. The research aims to document the art form and to look into the 'content' and 'form' of the Celibate designs. The designs on the art forms reflect the intimate interaction of the people with the natural environment. These pure and simple designs are indicative of a positive response to the community's complex social structures.

The designs on their handicrafts incorporate elements from the diverse natural resources in the environment. The basic design motifs are organic in nature, repetitive and reflect continuous movements of lines and shapes. Designs are based

on floral elements and the use of symbols is common in their art forms. Images and symbols feature dominantly in their mystical, spiritual as well as religious practices. The common visual elements featured are those of animals, birds, lizards and arthropomorphs. The use of symbols are meant to represent, preserve and validate their shared beliefs and values. The symbols used in the tattoo designs are a form of personal ornamentation, which symbolizes beauty, bravery, social hierarchy and status.

Industrial Design

The design technologists at the Faculty have been engaged in several projects. They were commissioned to design a portable kitchen unit suitable for camping purposes to be fitted in PRODUA Rusa (Second National car). Another major commission was by the Jabatan Agama Islam Sarawak to design an Astaka and multimedia presentation for the State Level Quran reading competition in 1995. The staff has also been engaged to design a new corporate image and multimedia presentation for the Sarawak Museum. Another study aims at documenting packaging designs available in the market today but deemed environmentally unfriendly with respect to their polluting forms, materials and designs. The study focuses on the impact the packaging designs have on the environment especially with respect to their forms and functions, packaging materials, production process and design management. The findings will provide insights into the current state of affair of our packaging designs that will enable us to develop better packaging design to minimize waste and pollution.

Ethnomusicology

An ethnomusic study of the Kelabits of Bario was initiated to look into the historical factors that contribute to the musical forms, instruments and music performance of this community. Kelabit music provides many social, cultural and religious functions. Singing plays a major role and the mood of the songs varies according to the ceremonies and functions where the music is played or performed. The Kelabit songs that have been documented by the staff at the Faculty include the Kuab which constitutes Kuab Raut which tells of the strength and greatness of the Kelabit people, Kuab Ngelue performed at ceremonies held to celebrate the birth of a child and Kuab Lua sung by women to welcome a newborn child. Other songs documented include the Laku, a song expressing about oneself, the Adih, a song for the harvesting season, the Sikih are songs about animals and the Lipun-Lipun, a song for the funeral ceremony. Among the musical instruments documented are the sape, suling, pagang, selangut, serude', belulut, ruding and gong.

Art History

A major area of interest in Art History and Theory has been in the Eastern reclamation of Modernism and Modern Art History, with a particular interest in the relationship between traditional metaphysics and the new ontology engendered by digital technology, particularly Internet technologies.

RESEARCH COMMUNICATIONS

A. CONFERENCES AND SEMINAR PRESENTATIONS

Niranjan Rajah and Hatta Azad Khan
Technology in the Arts
Conference on Technology-Assisted Teaching & Learning in Universities, Association of Southeast Asian Institutions of Higher Learning, Sarawak 1997

This paper presents the Faculty of Applied and Creative Art's approach in working towards fulfilling its vision of using technology as a platform to unite the various fine and applied art forms. This paper goes on to deal with the cultural politics of the information revolution and attempts to set the 'platform' for an Asian reclamation of the multimedia concept.

Niranjan Rajah
Prosthetics for the Mind, 1st Consciousness Reframed
Conference, Centre for Advanced Inquiry in the Interactive Arts, University of Wales College1997

Starting from the metaphysical premise of the philosophia perennis, this paper will ask if the telematic communications, the immersive virtual environments and the bio-electrical interfaces of the 'post-biological era' constitute a rapprochement of

traditional and modern ontolgies. Applying contemporary theories of 'mind', this paper will also attempt to 'picture' the change in human 'consciousness' and ask if humanity might be evolving new modes of communication that will take us towards a 'culture without objects'.

Niranjan Rajah
Art After the Internet,
INET97:The Global Frontiers, Seventh Annual conference of the Internet Society, Kuala Lumpur 1997

This paper theorizes that in the future, the values of nation will recede as various overlapping 'electronic communities' emerge. The contours of this new global culture of instantaneous communications will be shaped, as ever, by economic and political forces. Electronic boundaries, not as yet tangible will become manifest in time. Artists are playing a part in the mapping of this emerging 'topography' as they use the Internet to construct new arenas for their work. This paper also presents and contextualises their work.

Khairul Aidil Azlin Abdul Rahman
"Design Process Towards Innovation"
Sarawak Craft Towards The Millenium, Sarawak Craft Council,1997

The market demand for Sarawak Craft is encouraging. It has a significant and still growing audience at high and low ends of the market. This audience has a great respect for quality, craftsmanship and a passion for good design. This paper presents the philosophy of innovation and theoretical a model in the design process. The main aspect of this paper is the role of designers, markets and manufactures in the process of generating ideas and their translation into prototype products.

Nazlina Shaari
Borneo Textile: The Ethnic Influence,
International Conference on Cultural Aspect and Business Opportunities of Textile and Clothing
Singapore, July 9, 1997

One of the most obvious features of material culture of Eastern and Western countries is cloth. Peasant and nomad clothing from non-western cultures has been influencing the fashion and the garment industry since the early years of this century. Borneo also has its own unique form of cloth design. Most of these designs are composed of stylized leaves, flowers and animals. Each set of designs is interpreted according to the ritual and social situations in which it is presented. The influence of east on Western fashion is by no means a recent phenomenon. The interest in ethnic style continues and has applications at the younger end of the market.

Nazlina Shaari
Malay (Perak) Embroidery in Contemporary Batik,
Dunia Batik Conference and Exhibition
Yogyakarta, Indonesia, November 3, 1997

In Malay Perak tekat embroidery, gold tread is embroidered on a base fabric of velvet. This combination is called suji timbul or embossed embroidery. As batik gains a wider market nowadays, this leads to the possibility of creating a new dimension in contemporary batik with traditional tekat embroidery motifs. As time moves on, the study of batik may expand its scope even further using Computer Aided Design. I will discuss the new system, Integrated Computer Aided Tjanting System(ICATS) that can speed up batik production as it is able to produce designs faster than manual methods.

Niranjan Rajah
Who do you represent?
Present Encounters Conference, Second Asia-Pacific Triennial, Brisbane 1996

In the developing countries of Asia, art is potentially an instrument of social and cultural engineering. The contemporary artist could claim the delicate yet vital role of mediating between official and alternative 'images' of nation. It would be a shame if this potential is dissipated as our artists respond to the international demand for aesthetic commodities. This paper analyses and critiques the emerging Internationalism in the Asia Pacific scene.

Niranjan Rajah
Locating the Image
Seventh International Symposium on Electronic Art, Rotterdam1996

As East Asia accelerates from Medieval culture and consciousness, through a compressed period of industrial modernisation, into the communications

era, the convergence of living sacred traditions and information technology presents a deep ontological enigma. Starting from the premise that the 'image' is an index of the 'locus of reality', this session will attempt to 'locate the image' in an age of instantaneous communication, virtual reality and hypermedia.

Niranjan Rajah
Without Primitivism
Biennial Conference of the Borneo Research Council, Brunei1996

The idea of the 'Primitive' has distorted the way we view art from societies that are 'less mature' in their material, technical and economic development. Initially, ethnology approached this art as an 'object' of 'scientific' inquiry; while its 'artifacts' were displayed in exotic 'museums'; one even with live crocodiles in the basement. Then modernism used 'Primitive Art' as raw material for the renewal and revitalization of European culture. Today tourism reproduces the simulacrum of 'Primitive Art' as a commodity in a thriving industry. 'Primitivism' continues to obscure the fact that Animistic Art is a living sacred tradition; one that has responded to the advent of modernity and changes in belief. This paper argues that it is imperative that woodcarving and the other traditional forms of Borneo are approached as contemporary art.

Niranjan Rajah
Beyond Art History
ASEAN COCI Symposium on Aesthetics, Singapore1995

The study of art is dominated by the system of classification employed in organising its constituents. The governing principle in traditional art history is chronology. This historical approach is unsuitable for the study of art in Southeast Asia as the religious art in this region follows a historical sequence of its own. More pertinently, 'Sacred Art' is resistant to historical treatment of any kind. Further, we do not find Eastern art included in the histories of 'Modern Art'. We rarely find critical appraisals of the colonial appropriation of non-western art or anything more than a limited discussion of the impact of Eastern artists and thinkers on the practice of modern art. In this paper, I put forward a new classification for art studies in Southeast Asia. What I propose is a reclassification of 'World Art' based on the needs of Southeast Asian pedagogy and research.

Eileen Yen Ee Lee, Ahmad Khiri Zain and Kenneth Bringzen
Contemporary Sarawak Handicraft and Designs – An Export Potential
Seminar on Globalization and Impact on Culture and Traditions in Sarawak, December 1997

Zulkifli Mohammed
Lifestyle in the Borderless World: Marketing Sarawak Batik and Textiles as Cultural Identity
International Batik and Tourism Conference, Ministry of Tourism and Post Indonesia, Jogjakarta, Indonesia November 3 – 5 1997.

Zulkifli Mohammed
Nusantara Textiles: Marketing Sarawak Ethnic Motifs Textiles
International Conference on Business and Cultural Aspects of Textiles and Clothings, Nanyang Fine Arts Academy Singapore, 9 – 10 July 1997

Zulkifli Mohammed
Considering Hikayat Seri Rama and Hikayat Maharaja Wana (Adaptation of Ramayanan Epic) for New National Audience
SPAFA Symposium on the History of Performing Arts in South East Asia, National Arts Academy, Kuala Lumpur, 17 – 24 June, 1997.

Ahmad Khiri Zain
Better Packaging for Better Business
Malaysia Design Council in Collaboration with SIRIM 15 – 16 May, 1996

B. AWARDS, EXHIBITIONS AND PERFORMANCES

Fauzan Omar, Hasnul Jamal Saidon, Zulkalnain Zainal Abidin, Niranjan Rajah (curators)
EXPLORASI – an exhibition by the Fine Art Programme,
UNIMAS, Galeri Petronas, Dayabumi, Kuala Lumpur,1997

Hasnul Jamal Saidon
A solo exhibition – HYPERVIEW
National Art Gallery, Kuala Lumpur, 1997.

Hasnul Jamal Saidon
Composer's Forum
Manila, Philippines,1997

Hasnul Jamal Saidon, Niranjan Rajah
"Malaysian Drawings"
NationalArtGallery,KualaLumpur'1997

Hasnul Jamal Saidon and Mohd Fadzil Abdul Rahman
An interactive multimedia concert/installation Jambori Rimba
Panggung Eksperimen UNIMAS 1997

Khairul Aidil Azlin Abdul Rahman
National Day Logo Design Competition
Prime Minister Department 1997

Khairul Aidil Azlin Abdul Rahman
Pepper Shaker/Grinder Design Competition
Jemaah Pemasaran Ladahitam, Sarawak 1997

Nazlina Shaari & Khairul Aidil Azlin Abdul Rahman
Sarawak Craft Council Logo Competition
Sarawak Craft Council 1997

Rashidah Abd Salam, Wan Jamarul Imran Wan Abdullah Thani, Nazlina Shaari
Young Contemporary '97
National Art Gallery, Kuala Lumpur,1997
Penang Art Gallery, Penang,1997

Zulkalnain Zainal Abidin
Fotografi Sebagai Seni
National Art Gallery, Kuala Lumpur,1996

Hasnul Jamal Saidon
Asian-American Film and Video Festival
American Embassy, Kuala Lumpur,1996

Fauzan Omar
Asean Workshop/Symposium on Aesthetic
Singapore,1996

Fauzan Omar
"Joint Exhibition" with Norma Abbas
Citra Gallery, Kuala Lumpur, 1996

Ahmad Khiri Zain and Zulkalnain Zainal Abidin
A photographic exhibition entitles "Whispers in the Wind"
Museum Sarawak on August 8, 1996.

Fauzan Omar and Hasnul Jamal Saidon
2nd ASIA PACIFIC TRIENNIAL
Queensland Art Gallery, Brisbane Australia,1996

Fauzan Omar and Hasnul Jamal Saidon
Philip Morris ASEAN Art Exhibition
Gedung ASEAN, Jakarta, Indonesia,1995

Hasnul Jamal Saidon and Khairul Aidil Azlin Abd Rahman
1st Malaysian Video Awards
Video Headquarters and National Art Gallery, Kuala Lumpur,1995

Hatta Azad Khan
A Musical Theatre Tanah, Air, Api dan Angin
Ministry of Culture and Tourism Malaysia, Kuala Lumpur and MATIC 1995

Khairul Aidil Azlin Abdul Rahman
HICOM Leisure Award of Creative Excellence
HICOM Leisure 1995

Khairul Aidil Azlin Abdul Rahman
Sound & Images Design Competition
Malaysian Design Council 1995

C. PUBLICATIONS

Niranjan Rajah & Hasnul J Saidon (curators)
1st Electronic Art Show
National Gallery, Kuala Lumpur 1997

Niranjan Rajah
Prosthetics for the Mind
Digital Creativity Journal, London, April 1997

Khairul Aidil Azlin
Isu Alam Sekitar Dalam Rekabentuk Perabot,
Anjung Seni 1997

Niranjan Rajah
Art Education in a Climate of Convergence,
CIPTA98 Catalogue, Kuching1997

Niranjan Rajah & Hasnul J Saidon
1st Electronic Art Show
National Gallery, Kuala Lumpur 1997.
ISBN983-9572-17-2

Niranjan Rajah
Les Fleurs De Malaisie,
Second Asia-Pacific Triennial Exhibition Catalogue, Brisbane1996

Niranjan Rajah, Fauzan Omar, Zulkalnain Zainal Abidin, Hasnul J Saidon
Expolorasi Interactive CD-Rom catalogue
Petronas Gallery, Kuala Lumpur, 1996

THE FACULTY OF COGNITIVE SCIENCE & HUMAN DEVELOPMENT

INTRODUCTION

The Faculty focuses its academic concerns on expanding knowledge in understanding how the human mind receives, creates, analyses, stores, memorises, retrieves and interpretes information. Research activities here aim at unraveling how the capabilities of the human mind could be emulated by machines to make the latter humanly intelligent and capable of accommodating human values and preferences. In addition, the performance and productivity of workers in organizations and industries from the cognitive framework have also been of interest to some members of the Faculty. To conduct the above research, the faculty has adopted a multidisciplinary approach which incorporates principles and research methodologies of philosophy, cognitive psychology, cognitive neuroscience, artificial intelligence, neural network, linguistics and anthropology.

RESEARCH PROGRAMMES

Cognition and Learning

Research in this area is basically aimed at enhancing understanding of how learning occurs in the human mind. This includes among others the understanding of the mental processes of acquiring and interpretation of information, of memory and forgetting, of creativity and intelligence, and of developing intelligent software, multimedia and teaching machines to facilitate learning. In the past, learning has been heavily explored from the behavioural and cognitive perspectives. While the latter has gained high acceptance, the discipline that dominates research activity remains mainly within that of psychology. The contribution of psychology in explaining learning behaviour has indisputably been tremendous. However, there is still room for refinement and improvement. Evidently, many questions still remain unanswered and of those that seem to have been answered, some are still subjected to further scrutinization.

Learning evidently is a complicated and integrated behaviour. An understanding on the dynamics of the learning process requires input from various related disciplines which, besides phsycology, include anthropology, neuroscience, linguistics, artificial intelligence and philosophy. Accordingly, research interests at the Faculty include ***i***. Learning and Memory, specifically on issues of encoding, transfer and assessment, ***ii***. Learning and Constructivism, ***iii***. Cognitive thought processes of the novice and expert, ***iv***. Hypermedia and multimedia in learning, teaching and training and ***v***. Computer-based distance learning.

Cognition and Work Behaviour

In most organizations, productivity is their central concern. Productivity relates to workers'

performances that are influenced by their work behaviour. In turn, work behaviour refers to how workers conduct their jobs or businesses to achieve the desired goals. Researchers have identified that workers' work behaviour are influenced by various factors. Evidence has been accumulating which indicates a positive correlation between workers' work behaviour with the cognitive assumptions they hold of their work. While this observation augurs well for the cognitivist, it also urges more research into explicating how the cognitive paradigm can further enhance workers performances for increased productivity.

Of late, an added contribution to enhance work productivity has been the adoption of concepts of learning organization and action research. The former concept demands each organisation to continuously examine its strengths and weaknesses and learn to improve them using its available resources and recourse. To implement this idea, the latter concept of action research has increasingly been accepted as a useful tool mainly because it provides an ongoing methodology to meaningfully accommodate the dynamics of a learning organization. Accordingly, the Faculty has emphasized research in areas that include ***i.*** The effectiveness of human resource programme in small and medium size industries in Malaysia, ***ii.*** Action research and the effectiveness of learning organisations, ***iii.*** Computer-mediated technology and its contribution to worker's productivity, ***iv.*** Managers' and workers' thought processes on productive performance and ***v.*** Effective interpersonal relationship among workers and between managers and workers.

Cognition and Human Development

Research in this area focuses on the cognitive capability of human beings from infancy to old age. The mind, in its quest to comprehend events displays various degrees of mental capability as each human being grows and matures. While Piaget has been much quoted on his four levels of cognitive development, a lot still remains to be answered on their specific applications. Following Piaget, other scientists have emerged to postulate assumptions and theories intended to extend our understanding of the nature of cognitive development. The contribution of these scientists are highly commendable. Much of what was unknown about cognitive development has since come to light. However, despite what has been discovered, a lot more questions still remain unanswered. This is not surprising because cognitive development of the human being is not only extensive but increasingly discovered to be heavily influenced and differentiated by a myriad of variables inclusive of environmental, cultural and physiological.

Hence studies in this area must not only be vigorously pursued but must increasingly adopt integrated multidisciplinary approaches. This will yield more meaningful findings and interpretations on the dynamics of cognitive development. Adopting this approach, the Faculty has integrated disciplines of cognitive psychology, cognitive neurology and psycho sociology in efforts to understand ***i.*** The children's cognitive processes in quantitative thinking, ***ii.*** The children's cognitive behaviour and values formation, ***iii.*** The levels of human development and differences in their cognitive capabilities and ***iv.*** The children's cognitive dynamics in making sense of events and ideas.

Cognition and Human Machine Interaction

Research in this area focuses on two major issues. The first concerns the production of intelligent machines that are able to emulate the dynamics of human intelligence, while the second, concerns the injection of human values and preferences into the technological products developed. The quest to integrate human qualities with technological innovations has of late continued to receive increasing support from scientists due principally to a shift in their philosophical assumption separating human capabilities from those of technological, to one that welcomes their integration and placing human values and idiosyncrasy as recourse and point of reference. This seemingly pro-humanistic perspective in the relationship between human and technology, has opened up a vast array of interesting issues for researchers to identify, unfold and explain.

The Faculty is aligned to this shift in philosophical paradigm and its research direction in this area, therefore is grounded in the framework of the development of meaningful relationship between human cognitive dynamics and machine capability

and technological products. Along this line the research interest of the Faculty currently includes ***i***. The design of machines and products that provides better interaction with the human users, ***ii***. The development of intelligent auto-learning systems and ***iii***. The development of softwares to simulate events to facilitate learning, training, teaching and management activities.

RESEARCH COMMUNICATIONS

A. CONFERENCES AND SEMINAR PRESENTATIONS

Songan P.
Technology-assisted Teaching and Learning at institutions of Higher Learning in Malaysia
The Association of Southeast Asian Institutions of Higher Learning (ASAIHL) Seminar on Technology-Assisted Teaching & Learning in Universities, Kuching, August 1997

Institutions of higher learning (IHL) in Malaysia are undergoing a paradigm shift in teaching and learning due to the advent and rapid development of information technology (IT). Many researches have shown that IT is a powerful tool in reaching the highest levels of educational performance. With strong support from the Government that recognizes IT as a strategic factor for national development, IHL are taking all the necessary steps to upgrade and expand their IT infrastructures, and promote the extensive applications and usage of IT. Campus-wide network and computerized library systems have been set up. Centers providing IT-related services are also being established. This paper discusses some examples of how computer and communication technologies are used in teaching and learning in IHL in Malaysia. The future plans with regard to the use of IT in education are also described.

Hong Kian Sam & Michael Liau Tet Loke, 1995
The Use of Abacus in Penang Primary Schools: A Survey Research
International Conference on Innovation in Education: Significance to Teaching and Learning, PPIP, USM, 17-19 October 1995

The Malaysian Government decided in 1993 that primary school pupils be taught to use the abacus beginning in 1994. The Ministry of Education Malaysia envisages that with the implementation on the use of the abacus in primary schools, pupils will improve in their understanding and use of the basic mathematical operations and appreciate the uniqueness and usefulness of the abacus. A mail-survey using a questionnaire was mailed to the mathematics teachers in 124 primary schools. It was found that teachers were generally acceptable to using the abacus in class and the majority felt that the abacus will improve the quality of mathematics teaching. They however generally felt that the contents of courses can be further refined and improved.

Hong Kian Sam, 1996
Electronic Spreadsheets in Mathematics Classroom
VII National Science and Mathematics Symposium, ITM, KL, 3-5 December 1996

Increasing numbers of secondary schools in Malaysia are equipped with microcomputers either by the Ministry of Education or through private sectors. However, the availability of microcomputers in itself does not guarantee improvement in the teaching and learning of mathematics in school. How can educators harness the potential of microcomputers to enhance the mathematical teaching and learning process? More and more educators are of the view that the direction for integrating microcomputers into the teaching and learning process lies with off-the-shelf commercial software and not specifically developed coursewares. One such off-the-shelf commercial software suitable for mathematics teaching and learning is electronic spreadsheets, such as Excel or Lotus 123. Present day electronic spreadsheets satisfy the three basic features espoused by Goodfellow as essential features needed to ensure the suitability of the software for educational use. This paper focuses on the important pedagogic features of electronic worksheets for use in statistics through examining various examples of mathematics lessons in electronic worksheet formats. Effective interface for electronic worksheets are explored and issues in teaching and learning discussed.

Hong Kian Sam, 1996
Mathematical Laboratory Approach in Statistics Education
VII National Science and Mathematics Symposium, ITM, KL, 3-5 December 1996

Mathematics learning usually occur in drab classroom with neat rows of tables and chairs. This scenario is prevalent throughout Malaysian classrooms. This is the exact opposite of what mathematics educators envisage as the ideal mathematics learning environment. The learning of mathematics should be an active process with students totally immersed in learning activities and appreciating the beauty of mathematics. Secondary school mathematics involve the study of patterns, collecting and analyzing data and discovering formulas that simplify data representation. These natural features of mathematics make it a suitable subject for the laboratory learning approach. This paper outlines the conceptual model of mathematics laboratory approach. Principles and methods for implementing a laboratory-based lesson is presented through sample activities in secondary level statistics. Issues and suggestions for employing laboratory approach in the mathematics classroom are explored.

Hong Kian Sam, 1996
Innovative Use of Overhead Projector in Learning Science: A Reflection
National Seminar on Science and Mathematics Education, UKM, KL, 20-21 November, 1996

In the age on information technology, the use of computers is the favourite rhetoric of educators. In reality the process of providing the necessary hardware and software to schools may take a while. The introduction of a new teaching aids does not necessarily mean the present teaching aids are worthless or inadequate. The overhead projector was and still is the only teaching aid invented with the main aim of assisting the learning process. Overhead projectors are readily available in schools particularly in the science laboratories. Nonetheless, teachers seem to have forgotten the rationale behind the use of overhead projectors in the learning process. Teachers used overhead projectors as second blackboard with sheets of transparencies filled with texts and static diagrams. The strength of overhead projectors as a powerful visual medium that could generate students' interest in the lessons was not capitalized. This paper will demonstrate specific examples how the overhead projector can be harnessed to become powerful visual aids to improve students understanding of the lesson and also serve to motivate students' interest in science subjects. It is hoped that these practical activities will generate innovative ideas and make the teachers reflect and improve on their use of overhead projectors in the science classrooms.

Hong Kian Sam, 1997
Teachers and Students Perception of Classroom Physics Teaching and Learning
Regional Conference on Science and Technology Education, UTM-SEAMEO RIHED-AUPAP, UTM, 15-16 December, 1997.

The study investigates how far the teaching and learning process in the physics classroom complied with the goals of KBSM, which is based on inquiry and discovery learning approaches. Students should be actively involved in the learning process and encouraged to develop a critical and creative mind. However, the teaching and learning process was found to be wanting and more focussed on "surface approach in teaching and learning physics". Radical changes need to be implemented in the physics classrooms. Student-centered learning, less emphasis on examination, alternative assessments, reducing rote work load and emphasizing on quality work, and developing positive attitudes towards physics are some of the changes that need immediate attention.

Mai Ishak, Juergen Sauer, Hockey, G.R.J., Crawshaw, C.M., Wastell, D.G.
Multiple-task Performance on a Computer-simulated Ship's Bridge Environment
The 5th Southeast Asian Ergonomics Society Conference, Kuala Lumpur, November 1997

The paper reports a study carried out to examine the issue of integrating primary information sources on highly-automated ship's bridges. Employing a PC-based simulation of a generic ship's bridge environment, the study made a comparison between integrated and separated radar and chart displays during a prolonged watch, using collision scenarios of different complexity. Fifty-eight participants were assigned to 3 experimental groups, each using one of the three interfaces examined (integrated, spatially-separate and functionally-separate display). After being given a total of 5 hours of

training on the tasks, they completed an uninterrupted 4-hour testing session, comprising a sequence of 16 scenarios. The use of multiple-task environment allowed us to take measures of primary (e.g., track keeping and collision avoidance) and secondary task performance (e.g., oil temperature monitoring and prospective memory). In addition, information sampling strategies and subjective operator state (e.g., fatigue, anxiety, mental effort) were measured. The results showed overall little difference between the interface configurations, though track keeping was slightly better for the integrated condition. It was also observed that secondary task performance was poorer under the more complex scenarios, indicating the increased resource requirement for primary task completion under these conditions. Although there was a clear increase in fatigue levels over the duration of the watch, performance on primary and secondary tasks was not impaired. No changes were observed in information sampling behaviour throughout the long watch. The results have implications for our understanding of how operators manage high demands in complex tasks. The paper also supports the utilisation of computer-based simulations in researches in human performance in highly complex task environments.

Mohd Razali Othman and Rong Yang
Using Prolog for Handling Psychological Tests on the Internet
The Fifth International Conference on the Practical Application of Prolog. The Westminster Central Hall, London, UK. 22nd-24th April 1997

This paper presents a useful software tool for psychologists who handle psychological tests and analyses. Moreover, it can be used globally on the Internet. The software is written in Prolog. It consists of three components: a questionnaire handler, a data analyser, and a library interfacing between a WWW browser and Prolog. The first two components of the system were implemented by the first author, a counsellor who was a total beginner in computer science. The work has demonstrated that Prolog as a declarative language is suitable to be taught as the first computer language to people from other professions. In this paper, we describe the software implemented that covers the basic techniques of the future computer-aided psychological counselling system. We also show that our WWW browser supporting components can be used as a general library which allows any Prolog application to perform I/O to a WWW browser. This will certainly extend the power of Prolog to meet the increasing needs of Internet applications.

Judyth Gregory-Smith
Using A Functional Linguistic Approach To Teaching English For Business Purposes
Innovations and Future Directions in English for Specific Purposes (ESP); Johor Bahru, 14-16 November 1995.

A letter is often the first introduction in business. It represents the company and individual from which it comes and serves as an advertisement, an icon or a benchmark as to the type of company or service the recipient can expect. Business letters therefore can be important ambassadors disseminating factual information and exuding the standard of excellence. If not well written, however, business letters can deliver a negative image. One way to ensure business letters achieve their desired effect is to teach writers how to realise the meaning they require in the tenor that they wish to purvey. A functional linguistic approach to teaching writing empowers writers to create the specific meanings they desire to perform the different functions of business correspondence.

UNIVERSITI MALAYSIA SARAWAK

Kota Saramahan 94300 Kota Saramahan Sarawak

Tel : +6082 671000 Fax : +6082 674211